Emily

Scientific and Technical Aerospace Reports

LIBRARY
COLLEGE OF ENGINEERING
DUKE UNIVERSITY
MAR 6 1964

A SEMI-MONTHLY ABSTRACT JOURNAL WITH INDEXES

FEBRUARY 8, 1964

VOLUME 2 • NUMBER 3

N64-11439 – N64-12406

DOCUMENTS

FEB 21 1964

Duke University Library

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Purchase of *STAR*

The semimonthly issues and the cumulative index issues are available postpaid on subscription and in single copy from the Superintendent of Documents, United States Government Printing Office, Washington, D.C., 20402, United States of America.

Semimonthly issues. Annual subscription rate: $25.00, domestic; $31.00, foreign. Price per single copy: $1.50, domestic; 25¢ extra for foreign mailing.

Cumulative index issues. Annual subscription rate: $30.00, domestic; $34.00, foreign. Price per single copy varies according to the number of pages.

Domestic subscription rates apply to the United States, Canada, Mexico, and all Central and South American countries, except as noted below.

Foreign subscription rates apply to Argentina, Brazil, British and French Guiana, Surinam, British Honduras, and all other countries throughout the world.

Payment should be by check, money order, or document coupons, and must accompany order. Remittances from foreign countries should be made by international money order, or draft on an American bank, payable to the Superintendent of Documents, or by UNESCO book coupons.

Published by:
United States Government
National Aeronautics and Space Administration
Scientific and Technical Information Division

Scientific and Technical Aerospace Reports, Volume 2, is prepared by the Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Documentation Incorporated.

Use of funds for printing this publication approved by the Director of the Bureau of the Budget December 20, 1962

Introduction

What STAR Is

Scientific and Technical Aerospace Reports (STAR) is a comprehensive abstracting and indexing journal covering worldwide report literature on the science and technology of space and aeronautics. It is published twice each month.

Three major areas are covered in *STAR*:

1. Scientific and technical reports of the National Aeronautics and Space Administration and its contractors.
2. Scientific and technical reports of government agencies, universities, and research organizations throughout the world.
3. Scientific and technical articles prepared by employees of NASA and its contractors that appear in the learned and technical journals.

How STAR Is Organized

The first section of *STAR*, arranged by subject categories, contains informative abstracts and complete bibliographic citations. A second section consists of five indexes: subject, corporate source, author, report number, and accession number. Separate cumulative indexes are published quarterly, semiannually, and annually.

How to Use STAR

Readers are encouraged to examine the abstracts in each category of interest. If time is short, and when interest is concentrated in specific areas, readers may wish instead to scan source, author, and subject indexes. A more thorough coverage of a subject field may often be achieved by detailed examination of the subject listings, especially as they are cross-indexed in the quarterly indexes.

Availability of STAR and Documents

NASA documents (identified with an asterisk), as well as *STAR* itself, are available without charge to:

1. NASA Offices, Centers, contractors, subcontractors, grantees, and consultants.
2. Other U.S. Government agencies and their contractors.
3. Libraries that maintain depositories of NASA documents for public reference.
4. Other organizations having a need for NASA documents in work related to the aerospace program.
5. Foreign organizations that exchange publications with NASA, or that maintain depositories of NASA documents for public use.

AGARD reports that are not commercially available will also be provided by NASA to the organizations listed above.

Other non-NASA documents are provided without charge only to NASA Offices, Centers, contractors, subcontractors, grantees, and consultants.

How to Request Listed Documents

If you are registered with NASA, send a completed *Document Request* (Facility Form 492) to:

Scientific and Technical Information Facility
P. O. Box 5700
Bethesda, Maryland 20014

If you are eligible to receive documents without charge but are not registered with NASA, request *Registration Form—Technical Publications* (NASA Form 439) from:

Scientific and Technical Information Division
National Aeronautics and Space Administration
Code ATSS-AD
Washington, D.C., 20546

How the Public May Obtain Listed Documents

For reference purposes, NASA documents listed in *STAR* may be consulted at one of the organizations listed on the inside back cover. Commercial publications listed in *STAR* may usually be consulted in libraries or purchased from publishers or booksellers.

The public may purchase NASA documents listed in STAR from either of two sales agencies, as specifically identified in the abstract section:

Office of Technical Services (OTS)	Superintendent of Documents (GPO)
U.S. Department of Commerce	U.S. Government Printing Office
Washington, D.C. 20230	Washington, D.C. 20402

The public may purchase non-NASA documents by writing to the source, or to other information systems.

Abstracts of Journal Articles

By special arrangement between NASA and the American Institute of Aeronautics and Astronautics, the AIAA publication *International Aerospace Abstracts* is issued in coordination with *STAR*. Each journal appears on alternate weeks. *IAA* uses identical subject categories with those in *STAR*, and publishes identical indexes. *IAA's* worldwide coverage of books and scientific and trade journals complements *STAR's* worldwide report coverage. The two publications thus provide comprehensive access to current literature on aerospace science and technology.

Organizations having contractual relations with NASA may obtain *IAA* by writing NASA, Code ATSS-A, Washington, D.C. 20546. Others should direct inquiries to the American Institute of Aeronautics and Astronautics, 750 Third Avenue, New York, N.Y., 10017

Scientific and Technical Information Division
National Aeronautics and Space Administration

Table of Contents

Volume 2 Number 3 / February 8, 1964

Abstracts in the journal are grouped under the following categories: PAGE

01 GENERAL
Includes administration and management; space law and related legal matters; legislative hearings and documents; and symposia or conferences of a broad or a general nature 221

02 AERODYNAMICS OF BODIES, COMBINATIONS, AND INTERNAL FLOW
Includes aerodynamics of channels, cowls, ducts, ejectors, nozzles, etc. *For related information*: 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 11 Fluid Mechanics. 231

03 AERODYNAMICS OF WINGS, ROTORS, AND CONTROL SURFACES
Includes ailerons; airfoil sections; cascades; fans; flaps; propellers; rotors; slats; spoilers; etc. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 11 Fluid Mechanics. 233

04 AIRCRAFT
Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc., and specific types of complete aircraft (e.g., Ground Effects Machines, Flexible Wings, STOL, and VTOL); flight tests; operating problems; safety devices; and stability and control. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 30 Space Vehicles. 234

05 ASTRONOMY AND ASTROPHYSICS
Includes celestial mechanics; and radioastronomy. *For related information see*: 12 Geophysics; and 29 Space Sciences. 236

06 AUXILIARY SYSTEMS
Includes fuel cells and solar cells; gas turbines; hydraulic, pneumatic and electrical control systems and actuators; and inverters. *For primary propulsion systems see*: 27 Propulsion. *For related information see*: 08 Communications; 09 Electronics; 10 Facilities, Research and Support; 15 Instrumentation and Photography; and 22 Navigation and Guidance. 237

07 CHEMISTRY
Includes chemical analysis and identification (e.g., spectroscopy); chemical engineering; chemical properties of materials; and synthesis. *For related information see*: 18 Materials, Metallic; 19 Materials, Nonmetallic; and 26 Propellants and Combustion. 241

08 COMMUNICATIONS
Includes communications equipment and techniques; noise; radio and communications blackout; telemetry; tracking; and wave propagation. *For tracking stations see*: 10 Facilities, Research and Support. *For related information see*: 06 Auxiliary Systems; 09 Electronics; 15 Instrumentation and Photography; and 22 Navigation and Guidance. 246

09 ELECTRONICS
Includes circuits and circuit theory; electronic components (e.g., tunnel diodes, transistors, and tubes); and feedback and control theory. *For related information see*: 06 Auxiliary Systems; 08 Communications; 15 Instrumentation and Photography; 22 Navigation and Guidance; and 25 Physics, Solid-State. **250**

10 FACILITIES, RESEARCH AND SUPPORT
Includes airports; lunar and planetary bases; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands and wind tunnels); test ranges; and tracking stations. *For related information see*: 06 Auxiliary Systems. **254**

11 FLUID DYNAMICS
Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; 13 Heat Transfer and Thermodynamics; and 24 Physics, Plasma. **257**

12 GEOPHYSICS
Includes auroral phenomena; upper atmosphere studies; oceanography; cartography; geodesy; and geomagnetism. *For Van Allen belts see*: 28 Space Radiation. *For related information see*: 05 Astronomy and Astrophysics; 21 Meteorology; and 29 Space Sciences. **261**

13 HEAT TRANSFER AND THERMODYNAMICS
Includes ablation; cooling; heating; and other thermal effects. *For aerothermodynamics see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 03 Aerodynamics of Wings, Rotors, and Control Surfaces. *For combustion see*: 26 Propellants and Combustion. *For related information see*: 11 Fluid Mechanics. . . **268**

14 HUMAN BEHAVIOR
Includes crew training and evaluation; piloting; and psychological factors. *For simulators see*: 10 Facilities, Research and Support. *For related information see*: 16 Life Sciences. **272**

15 INSTRUMENTATION AND PHOTOGRAPHY
Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gauges; sensors and transducers; and telescopes and cameras. *For related information see*: 06 Auxiliary Systems; 08 Communications; 09 Electronics; and 22 Navigation and Guidance. **274**

16 LIFE SCIENCES
Includes biology; exobiology; physiology; medicine; life support systems; radiation effects on biological systems; and space sickness. *For related information see*: 14 Human Behavior; and 28 Space Radiation. **278**

17 MACHINE ELEMENTS AND PROCESSES
Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; and materials fabrication, handling and inspection. *For related information see*: 06 Auxiliary Systems. **298**

18 MATERIALS, METALLIC
Includes cermets; mechanical and physical properties of alloys and metals; and metallurgy. *For related information see*: 07 Chemistry; 17 Machine Elements and Processes; 19 Materials, Nonmetallic; 33 Stresses and Loads; and 34 Structural Design. **302**

19 MATERIALS, NONMETALLIC
Includes mechanical and physical properties of nonmetals (e.g., plastics). *For related information see*: 07 Chemistry; 17 Machine Elements and Processes; 18 Materials, Metallic; 33 Stresses and Loads; and 34 Structural Design. **311**

20 MATHEMATICS
Includes calculation methods and theory; computers; data processing; and numerical analysis. *For related information see*: 08 Communications; 09 Electronics; 10 Facilities, Research and Support; and 22 Navigation and Guidance. **315**

21 METEOROLOGY
Includes climatology; weather forecasting; and lower atmosphere studies. *For related information see*: 05 Astronomy and Astrophysics; 12 Geophysics; and 29 Space Sciences. **324**

22 NAVIGATION AND GUIDANCE
Includes autopilots; star tracking; inertial platforms; and air traffic control. *For related information see*: 06 Auxiliary Systems; 08 Communications; 09 Electronics; 10 Facilities, Research and Support; 15 Instrumentation and Photography; 20 Mathematics; and 29 Space Sciences. **330**

23 PHYSICS, GENERAL
Includes acoustics; cryogenics; and optics. *For astrophysics see*: 05 Astronomy and Astrophysics. *For related informations see*: 12 Geophysics; 24 Physic, Plasma; 25 Physics, Solid-State; and 29 Space Sciences. **332**

24 PHYSICS, PLASMA
Includes fusion; and magnetohydrodynamics. *For related information see*: 05 Astronomy and Astrophysics; 23 Physics, General; and 25 Physics, Solid-State. **347**

25 PHYSICS, SOLID-STATE
Includes semiconductor theory; and masers. *For related information see*: 09 Electronics; 23 Physics, General; and 24 Physics, Plasma. **351**

26 PROPELLANTS AND COMBUSTION
Includes fuels; igniters; and oxidizers. *For related information see*: 07 Chemistry; and 27 Propulsion. **354**

27 PROPULSION
Includes airbreathing, electric, liquid, nuclear, and solid propulsion. *For related information see*: 04 Aircraft; 06 Auxiliary Systems; 26 Propellants and Combustion; and 30 Space Vehicles. **356**

28 SPACE RADIATION
Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. *For related information see*: 05 Astronomy and Astrophysics; 16 Life Sciences; and 29 Space Sciences. **357**

29 SPACE SCIENCES
Includes space chemistry; cosmology; lunar and planetary exploration; and theoretical analysis of orbits and trajectories. *For space biology see*: 16 Life Sciences. *For related information see*: 05 Astronomy and Astrophysics; 12 Geophysics; and 22 Navigation and Guidance. **361**

30 SPACE VEHICLES
Includes launch vehicle-spacecraft combinations; missile systems; operating problems; safety devices; and stability and control. *For manned space capsules, satellites, and sounding rockets and space probes see*: 32 Space Vehicles (Spacecraft). *For boosters and launch vehicles see*: 31 Space Vehicles (Launch Vehicles). *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance. **364**

31 SPACE VEHICLES (LAUNCH VEHICLES)

Includes boosters; clustered rockets; and multistage rockets. *For propulsion engines see*: 27 Propulsion. *For manned space capsules, satellites, and sounding rockets and space probes see*: 32 Space Vehicles (Spacecraft). *For launch vehicle-spacecraft combinations see*: 30 Space Vehicles. *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance. 365

32 SPACE VEHICLES (SPACECRAFT)

Includes manned space capsules; satellites; and sounding rockets and space probes. *For boosters and launch vehicles see*: 31 Space Vehicles (Launch Vehicles). *For launch vehicle-spacecraft combinations see*: 30 Space Vehicles. *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance. 366

33 STRESSES AND LOADS

Includes fatigue; vibration; flutter; and structural tests. *For thermal stress see*: 13 Heat Transfer and Thermodynamics. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 34 Structural Design. 369

34 STRUCTURAL DESIGN

Includes structural elements; and weight analysis. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 33 Stresses and Loads. 372

SUBJECT INDEX I-1

CORPORATE SOURCE INDEX I-81

PERSONAL AUTHOR INDEX I-107

REPORT/ACCESSION NUMBER INDEX I-151

ACCESSION/REPORT NUMBER INDEX I-159

VOLUME 2 NUMBER 3

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

February 8, 1964

01 GENERAL

Includes administration and management; space law and related legal matters; legislative hearings and documents; and symposia or conferences of a broad or general nature.

N64-11478 Joint Publications Research Service, Washington, D.C.
ARTICLES ON SOVIET POWDER METALLURGY
M. Yu Bal'shin et al 28 Mar. 1963 29 p refs Transl. into ENGLISH of 5 articles
(JPRS-18407; OTS-63-21442) OTS: $0.50

CONTENTS:

1. SOME ASPECTS OF THE HYDROSTATIC PRESSING OF POWDERS M. Yu. Bal'shin and A. P. Dubrovskiy p 1–5 refs (See N64-11479 03-17)

2. A RADIATION METHOD OF PREPARING FINELY DIVIDED METALS AND OXIDES G. M. Zhabrova, V. M. Kadenatsi, T. S. Azizov, A. A. Gordeyeva, P. Ya. Glazunov et al p 6–8 refs (See N64-11480 03-17)

3. WETTING AND IMPREGNATION OF BRIQUETTES OF TITANIUM AND ZIRCONIUM NITRIDES BY MOLTEN COBALT AND NICKEL L. V. Beylina and I. P. Kislyakov p 9–15 refs (See N64-11481 03-18)

4. CAUSES OF LAMINATION CRACKS IN PRESSINGS MADE OF METAL POWDERS A. N. Nikolayev p 16–18 refs (See N64-11482 03-17)

5. PRESSING OF METAL POWDERS S. Ya. Plotkin and G. V. Sansonov p 19–26 refs (See N64-11483 03-17)

N64-11484 Joint Publications Research Service, Washington, D.C.
RECENT DEVELOPMENTS IN GEOPHYSICS
V. D. Lomanyy et al 22 Apr. 1963 150 p refs Transl. into ENGLISH of 15 articles from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962
(JPRS-18819; OTS-63-21629) OTS: $2.75

CONTENTS:

1. MEASURING THE COMPONENTS OF THE EARTH'S GEOMAGNETIC FIELD BY THE PROTON RESONANCE METHOD V. D. Lomanyy, A. G. Prokof'yev, and B. M. Yanovskiy p 1–11 refs (See N64-11485 03-12)

2. USING NATURAL ELECTROMAGNETIC VARIATIONS FOR INVESTIGATION OF THE EARTH'S UPPER LAYERS M. N. Berdichevskiy, B. Ye. Bryunelli, A. Ye. Lantsov, O. M. Raspopov p 12–17 refs (See N64-11486 03-12)

3. PLOTTING MAGNETOTELLURIC SOUNDING CURVES ACCORDING TO RECORDINGS OF SHORT-PERIOD VARIATIONS IN THE NATURAL GEOMAGNETIC FIELD A. V. Kovtun p 18–26 refs (See N64-11487 03-12)

4. CALCULATION OF THE LOW-FREQUENCY DIPOLE FIELD IN THE FAR ZONE L. B. Gasanenko and G. P. Sholpo p 27–38 refs (See N64-11488 03-23)

5. SOME FUNCTIONS OF THE COMPLEX ARGUMENT WHICH APPEAR IN THE LOW-FREQUENCY FIELD THEORY L. B. Gasanenko, G. P. Sholpo, and E. I. Terekhin p 39–70 refs (See N64-11489 03-23)

6. APPROXIMATE FORMULA FOR A DIPOLE FIELD ABOVE A HORIZONTAL LAMELLAR STRUCTURE WITH A POORLY CONDUCTING BASE L. B. Gasanenko p 71–74 refs (See N64-11490 03-23)

7. DIRECTIONAL ELECTROMAGNETIC SOUNDING G. V. Molochnov p 75–84 refs (See N64-11491 03-12)

8. COMPARISON OF THE INDUCTION METHOD WITH THE DIPOLE ELECTROMAGNETIC METHOD ON A THIN CONDUCTING PLATE (MODEL) G. V. Molochnov and G. M. Grebennikov p 85–89 refs (See N64-11492 03-23)

9. REPRESENTATION OF OBSERVATIONAL DATA OF ALTERNATING-CURRENT PROSPECTING AS AN APPARENT SPECIFIC RESISTANCE A. V. Veshev p 90–105 refs (See N64-11493 03-23)

10. THE USE OF LOW-FREQUENCY ALTERNATING CURRENT IN ELECTRICAL PROFILING AND SOUNDING Yu. I. Bulgakov and A. V. Veshev p 106–111 refs (See N64-11494 03-12)

11. METHODS OF CALCULATING A POINT-SOURCE FIELD IN THE PRESENCE OF A VERTICAL BED N. A. Sakharnikov and D. M. Volkov p 112–123 refs (See N64-11495 03-23)

12. INFLUENCE OF THE EARTH-AIR BOUNDARY ON THE ELECTRICAL FIELD OF A POLARIZED SPHERE G. A. Tarasov p 124–126 refs (See N64-11496 03-12)

13. LOW-FREQUENCY NCHMU EQUIPMENT FOR PROSPECTING D. R. Barkhatov p 127–129 (See N64-11497 03-12)

14. CONCERNING THE VERTICAL TORSION BALANCE THEORY B. V. Gran p 130–137 refs (See N64-11498 03-23)

15. PLOTTING WAVE-FRONT CHARTS WITH AN ARBITRARY LAW OF CHANGE IN SEISMIC VELOCITY WITH DEPTH Yu. Ye. Nekrasov p 138–146 refs (See N64-11499 03-12)

N64-11502* National Aeronautics and Space Administration, Washington, D.C.
CONFERENCE ON SPACE, SCIENCE, AND URBAN LIFE, DUNSMUIR HOUSE, OAKLAND, CALIFORNIA, MARCH 28-30, 1963 Proceedings

Wayne E. Thompson et al 1963 265 p refs Conf. supported by NASA and The Ford Foundation in cooperation with California U. and the city of Oakland, Calif.
(NASA SP-37) GPO: $1.75

CONTENTS:

1. THE SPACE CITY, AND THE CONFERENCE OBJECTIVES W. E. Thompson p 1–3 (See N64-11503 03-01)

2. IMPLICATIONS OF THE SPACE EFFORT FOR SCIENCE AND TECHNOLOGY G. L. Simpson, Jr. p 5–10 (See N64-11504 03-01)

3. AN INSIGHT TO THE SCOPE OF THE NATIONAL SPACE EXPLORATION PROGRAM D. D. Wyatt p 11–25 (See N64-11505 03-29)

4. GOALS AND POTENTIALS OF SCIENTIFIC RESEARCH IN SPACE H. E. Newell p 29–44 (See N64-11506 03-01)

5. IS OUR SCIENTIFIC RESEARCH SERVING THE NEEDS OF THE NATION? G. P. Miller p 45–49 (See N64-11507 03-01)

6. TWENTY YEARS OF ECONOMIC AND INDUSTRIAL CHANGE R. A. Gordon p 51–65 refs (See N64-11508 03-01)

7. THE IMPACT OF SCIENTIFIC TECHNOLOGY UPON INDUSTRY AND SOCIETY J. B. Wiesner p 67–71 (See N64-11509 03-01)

8. SOME OPPORTUNITIES AND OBSTACLES IN TRANSFERRING NEW TECHNOLOGY AMONG VARIOUS SECTORS OF THE ECONOMY C. N. Kimball p 73-82 (See N64-11510 03-01)

9. ECONOMIC, POLITICAL, AND SOCIOLOGICAL IMPLICATIONS OF EXPANDING SPACE AND SCIENTIFIC KNOWLEDGE J. H. Hollomon p 83-87 (See N64-11511 03-01)

10. RESEARCH, EDUCATION, AND GOVERNMENT—A SPECIAL MESSAGE ON BEHALF OF THE STATE OF CALIFORNIA E. G. (Pat) Brown p 89–91 (See N64-11512 03-01)

11. PERSPECTIVE AND OBJECTIVES OF OUR NATIONAL SPACE PROGRAM J. E. Webb p 93–97 (See N64-11513 03-01)

12. WHAT SCIENTIFIC DEVELOPMENTS WILL AFFECT THE TRANSPORTATION, COMMUNICATION, POWER RESOURCES, AND CONSTRUCTION INDUSTRIES IN THE YEARS IMMEDIATELY AHEAD? W. O. Baker p 103–126 (See N64-11514 03-01)

13. CAN NEW SPACE AND SCIENTIFIC TECHNOLOGY BE APPLIED TO BASIC COMMUNITY PROBLEMS OF WATER SUPPLY, AIR POLLUTION, PUBLIC HEALTH AND SAFETY, AND SANITATION? K. W. Wolf p 129–142 (See N64-11515 03-01)

14. WHAT DOES THE SPACE PROGRAM REVEAL ABOUT HUMAN ENGINEERING AND MEDICAL RESEARCH? E. B. Konecci p 145–157 (See N64-11516 03-16)

15. DEVELOPING AND MAINTAINING OPEN CHANNELS OF COMMUNICATIONS BETWEEN THE LABORATORY, INDUSTRY, AND THE COMMUNITY G. L. Simpson, Jr. p 161–172 (See N64-11517 03-08)

16. WHAT SPECIFIC IMPLICATIONS DOES EXPANDING TECHNOLOGY HAVE UPON THE PROBLEMS OF METROPOLITAN AREAS? M. Meyerson p 175–189 refs (See N64-11518 03-01)

17. HOW DO THE CHANGING DEMANDS FOR MANPOWER AND TECHNICAL PRODUCTION AFFECT THE ECONOMY OF INDUSTRY AND THE COMMUNITY? B. D. Haber p 193–208 (See N64-11519 03-01)

18. WHAT IMMEDIATE PROGRESS CAN BE MADE TO APPLY NEW SPACE AND SCIENTIFIC TECHNOLOGY TO GREATER USE IN OUR URBAN AND INDUSTRIAL COMMUNITIES? D. L. Putt p 211–225 (See N64-11520 03-01)

N64-11503* Ford Foundation, New York, N.Y.
THE SPACE CITY, AND THE CONFERENCE OBJECTIVES
Wayne E. Thompson *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., Mar. 28–30, 1963 p 1–3 (See N64-11502 03-01) GPO: $1.75

A conference was presented to explore new ideas and to evaluate new applications of space research to the problems of a city and its business and industrial community. Leaders in space technology and urban specialists of the nation were brought together in an attempt to set the course and to develop the pattern for applying this scientific know-how to the problems of urban living. Oakland, California is used as an example of a type of city with problems that need solutions. How to apply space-science techniques and materials to these problems is discussed. C.L.W.

N64-11504* National Aeronautics and Space Administration, Washington, D.C.
IMPLICATIONS OF THE SPACE EFFORT FOR SCIENCE AND TECHNOLOGY
George L. Simpson, Jr. *In its* Conf. on Space, Sci., and Urban Life, Oakland, Calif., Mar. 28–30, 1963 p 5–10 (See N64-11502 03-01) GPO: $1.75

The position of space technology and the progress of the United States space program are discussed in terms of finance, importance, and essentiality. A brief description of NASA's space program is given. The discussion is presented in a possible attempt to devise ways in which the techniques of the space age and science can be brought to bear on the problems which now confront metropolitan centers. C.L.W.

N64-11506* National Aeronautics and Space Administration, Washington, D.C.
GOALS AND POTENTIALS OF SCIENTIFIC RESEARCH IN SPACE
Homer E. Newell *In its* Conf. on Space, Sci., and Urban Life, Oakland, Calif., Mar. 28–30, 1963 p 29–44 (See N64-11502 03-01) GPO: $1.75

To promote an understanding of the scope, objectives, accomplishments, and potentialities of the space program, in the hope that social engineers will discern how the space program can be used along with other tools in promoting regional development and growth, the space-science aspect of the space program is reviewed. Emphasis is placed on the necessity of the integration of the scientific disciplines by the scientists and engineers in order to continue progressing in the investigations of the earth and the sun, the moon and the planets, the stars and galaxies, the space environment, and the possibilities of the existence of life in space. Charts are given showing the scientific satellites launched from 1959 through 1962, deep-space probes launched from 1958 through 1962, sounding rockets fired from 1956 through 1962, geophysics and astronomy programs proposed for 1962 through 1967, and lunar and planetary programs proposed for 1962 through 1967. C.L.W.

N64-11507* Congress. House. Committee on Science and Astronautics
IS OUR SCIENTIFIC RESEARCH SERVING THE NEEDS OF THE NATION?
George P. Miller *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., Mar. 28–30, 1963 p 45–49 (See N64-11502 03-01) GPO: $1.75

Comments are made on the possibility of identifying, in terms of human needs, pressing problems that deserve much more attention from the scientific community than they presently receive. Questions are asked as to whether the future vigor, security, and advancement of our people can be assured

by the use now made of science and technology. Also questioned is whether the momentum will be maintained and the strength preserved of the unique force of the U.S.—the unmatched ability to translate into practical terms the results of research. C.L.W.

N64-11508* California U., Berkeley
TWENTY YEARS OF ECONOMIC AND INDUSTRIAL CHANGE
Robert A. Gordon *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., 28–30 Mar. 1963 p 51–65 refs (See N64-11502 03-01) GPO: $1.75

A review is given of the behavior and changing structure of the economy during the past 20 years as a result of scientific and technological progress. Some of the major trends that can be discerned since the end of the 1930's are discussed. The average growth rates in the gross national product for selected periods are discussed, along with the labor-force participation rates, employment, unemployment, wages and salaries. C.L.W.

N64-11509* Massachusetts Inst. of Tech., Cambridge
THE IMPACT OF SCIENTIFIC TECHNOLOGY UPON INDUSTRY AND SOCIETY
Jerome B. Wiesner *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., Mar. 28–30, 1963 p 67–71 (See N64-11502 03-01) GPO: $1.75

Problems have been created for towns, and for social and industrial organizations that have grown much larger and more complicated as a result of the technological application of scientific research. The need is emphasized for the acceleration and accentuation of studies in the behavioral sciences, in urban affairs, and in the entire management of private and public enterprises. Other problems mentioned include problems of pollution and contamination, provision of an adequate water supply, noise reduction for urban areas, transportation problems, and development of more effective educational systems. C.L.W.

N64-11510* Midwest Research Inst., Kansas City, Mo.
SOME OPPORTUNITIES AND OBSTACLES IN TRANSFERRING NEW TECHNOLOGY AMONG VARIOUS SECTORS OF THE ECONOMY
Charles N. Kimball *In* NASA, Wash., D.C. Conf., on Space, Sci., and Urban Life, Oakland, Calif., Mar. 28–30, 1963 p 73–82 (See N64-11502 03-01) GPO: $1.75

A discussion is given concerning the obstacles and the opportunities involved in the transfer of technology among the various sectors of the economy. It is stated that the utility of science and technology lies in what its use can accomplish in the expansion of regional economies, corporate profits, and government mission capabilities—local, State, or Federal. Although science and technology possess immense potentialities, research has not resulted in the returns which could be realized. Four barriers are given which restrict the transfer of technology. These barriers are lack of management insight into the markets required for the results of research; the inability of the scientist to communicate his findings because he has little understanding or drive, or is shielded from commercial pressures; outside or institutional factors which limit science and technology; and the lack of creative people, along with the unwillingness of people to take the types of risks that technology transfer involves. C.L.W.

N64-11511* Commerce Dept., Washington, D.C.
ECONOMIC, POLITICAL, AND SOCIOLOGICAL IMPLICATIONS OF EXPANDING SPACE AND SCIENTIFIC KNOWLEDGE
J. Herbert Hollomon *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., 28–30 Mar. 1963 p 83–87 (See N64-11502 03-01) GPO: $1.75

The relationship between the growth of our economy and the ability to develop, to use, and to invest in technical resources is discussed. Further economic growth through an increase in productivity is considered. This productivity includes both the ability to translate technical resources to meet the needs of society and successful trading on both the domestic and foreign markets. The importance of the entrepreneur to exploit the technical resources of a country is pointed out. It is stated that the creation of an environment which will stimulate entrepreneurship, will cause the economy to develop and prosper. C.L.W.

N64-11512*
RESEARCH, EDUCATION, AND GOVERNMENT– A SPECIAL MESSAGE ON BEHALF OF THE STATE OF CALIFORNIA
Edmund G. (Pat) Brown *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life., Oakland, Calif., Mar. 28–30, 1963 p 89–91 (See N64-11502 03-01) GPO: $1.75

The integration of the efforts of research, education, industry, and Government is a necessity if the problems confronting the space age are to be solved. If the objectives of the Nation are to be achieved, heavy investments must be made in education and in top quality government. Emphasis is placed on the development of new attitudes toward the Government and its role in the free enterprise society, if our form of government is to prove superior over that of communism. C.L.W.

N64-11513* National Aeronautics and Space Administration, Washington, D.C.
PERSPECTIVE AND OBJECTIVES OF OUR NATIONAL SPACE PROGRAM
James E. Webb *In its* Conf. on Space, Sci., and Urban Life, Oakland, Calif., Mar. 28–30, 1963 p 93–97 (See N64-11502 03-01) GPO: $1.75

Concern arises for the problems confronting our rural and urban areas and which have resulted from the advances of science and technology. The fruits of research have caused certain ancient economic, social, and political concepts to become outmoded, and one of the greatest problems is to adapt the method of living to the current line of changes in scientific and technological advances and to develop new socioeconomic concepts which will parallel progress in the space age. Attention is given to the solution of these problems through the creation of favorable conditions compatible to the American system of private enterprise. The knowledge gained and the skills developed are identified and made available for use in the industrial stream to contribute to economic growth and to the nation's power to survive. Also discussed is the development of viable relationships among science, education, industry, and government to utilize research results for productive purposes; to create the legislative framework needed to meet the needs of the time; and to bring into effective use the wisdom of the economists and other social scientists. C.L.W.

N64-11514* Bell Telephone Labs., Inc., Murray Hill, N.J.
WHAT SCIENTIFIC DEVELOPMENTS WILL AFFECT THE TRANSPORTATION, COMMUNICATION, POWER RESOURCES, AND CONSTRUCTION INDUSTRIES IN THE YEARS IMMEDIATELY AHEAD?
William O. Baker *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., 28–30 Mar. 1963 p 103–126 (See N64-11502 03-01) GPO: $1.75

Attention is given to the fact that, in order to realize the full effect of scientific developments on the industries of transportation, communication, power resources, and construction, techniques must be improved for the translation of scientific discoveries into practical forms, and there must exist a national policy which will recognize the increasing difficulties of innovation in the large systems that are typical of such industries. The following areas are discussed: the qualities of service industries affecting progress; the relationship of national space goals to industrial science; systems technology common to space and industrial operations; principal areas in science affecting service industries; the impact of computer science on basic industries; the relationship between design and process control; mechanized information handling for product control; the effect of computer techniques on the status of engineering; nuclear power and civilian science; system analysis in nuclear power programs; materials and national scientific progress; the processing of earth solids; the role of composite materials in industry; material properties and crystal physics; and the revolutionary aspects of materials science. C.L.W

N64-11515* North American Research Corp., Chicago, Ill.
CAN NEW SPACE AND SCIENTIFIC TECHNOLOGY BE APPLIED TO BASIC COMMUNITY PROBLEMS OF WATER SUPPLY, AIR POLLUTION, PUBLIC HEALTH AND SAFETY, AND SANITATION?
Karl W. Wolf *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., 28–30 Mar. 1963 p 129–142 (See N64-11502 03-01) GPO: $1.75

Consideration is given to the application of space age scientific technology to urban operations. Concentration is placed in the areas of water supply, waste disposal, and air pollution. A brief survey of the characteristics of these areas is given along with a discussion of the type of scientific techniques and the technological processes under consideration. Author

N64-11518* Harvard-MIT Joint Center for Urban Studies, Cambridge, Mass.
WHAT SPECIFIC IMPLICATIONS DOES EXPANDING TECHNOLOGY HAVE UPON THE PROBLEMS OF METROPOLITAN AREAS?
Martin Meyerson *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., 28–30 Mar. 1963 p 175–189 refs (See N64-11502 03-01) GPO: $1.75

The following are some of the problems created by the expansion of technology in metropolitan areas: provision of adequate water supplies, air and highway traffic control, weather problems, housing problems resulting from population booms, recreation problems, and medical problems. C.L.W.

N64-11519* North American Aviation, Inc., El Segundo, Calif.
HOW DO THE CHANGING DEMANDS FOR MANPOWER AND TECHNICAL PRODUCTION AFFECT THE ECONOMY OF INDUSTRY AND THE COMMUNITY?
Bernard D. Haber *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., 28–30 Mar. 1963 p 193–208 (See N64-11502 03-01) GPO: $1.75

The effects that the progress and demands of the aircraft and aerospace industry have had on the national economy and on local economies were discussed. Industry is cited as a leading source of employment, income, and business for many communities. Enrichment of many educational programs has resulted from the increased demand for scientific knowledge and technical ability. C.L.W.

N64-11520* United Aircraft Corp., Palo Alto, Calif.
WHAT IMMEDIATE PROGRESS CAN BE MADE TO APPLY NEW SPACE AND SCIENTIFIC TECHNOLOGY TO GREATER USE IN OUR URBAN AND INDUSTRIAL COMMUNITIES?
Donald L. Putt *In* NASA, Wash., D.C. Conf. on Space, Sci., and Urban Life, Oakland, Calif., 28–30 Mar. 1963 p 211–225 (See N64-11502 03-01) GPO: $1.75

The key to the solution of the socioeconomic problems of the urban areas, utilizing the methods and techniques of scientific technology, is the establishment of proper communication between the researchers, management, and the community, along with an adequate understanding of the nature of the problems concerned. C.L.W.

N64-11521 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM ZHURNAL VYSSHEY NERVNOY DEYATEL'NOSTI IMENI I. P. PAVLOVA
12 Feb. 1963 41 p refs Transl. into ENGLISH from J. of Higher Nervous Activity (Moscow), v. 12, no. 6, 1962 p 1001–1010, 1021–1028 and 1055–1064
(JPRS-17586; OTS-63-21107) OTS: $1.00

CONTENTS:

1. THE INTERACTION OF THE ANALYZERS UNDER FLIGHT CONDITIONS ON AIRPLANES AND SPACESHIPS V. V. Baranovskiy, M. D. Yemel'yanov and A. G. Kuznetsov p 1–12 refs (See N64-11522 03-14)

2. ELECTROPHYSIOLOGICAL STUDY OF THE ACTIVITY OF CUTANEOUS AND MOTOR ANALYZERS UNDER CONDITIONS OF ACCELERATION EFFECTS E. V. Markukhanyan, P. I. Isakov, B. F. Asyamolov, G. I. Pavlov and V. V. Usachev p 13–24 refs (See N64-11523 03-14)

3. MOBILITY OF NERVOUS PROCESSES IN DOGS OF DIFFERENT AGES IRRADIATED ANTENATALLY WITH IONIZING RADIATION M. G. Ayrapetyants p 25–38 refs (See N64-11524 03-16)

N64-11525 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM FIZIKA METALLOV I METALLOVEDENIYE
13 Feb. 1963 27 p refs Transl. into ENGLISH of 3 articles from Phys. of Metals and Metallography (Sverdlovsk) v. 14, no. 1, 1962 p 137–139, p 10–16, p 148–150
(JPRS-17613; OTS-63-21122) OTS: $0.75

CONTENTS:

1. ABOUT THE RELATIONSHIPS OF COERCIVE FORCES OF MAGNETICALLY-SOFT MATERIALS TO THE THICKNESS OF SHEET MADE FROM ROLLED POWDERS O. A. Kaste p 1–5 refs (See N64-11526 03-18)

2. RELATIONSHIP OF THE NUMBER OF DEFECTS IN SINGLE CRYSTALS TO THE DIRECTION OF IRRADIATION M. V. Fedulov p 6–17 refs (See N63-11527 03-25)

3. MECHANISM OF TWINNING IN THE DEFORMATION OF SINGLE CRYSTALS OF A Mo-35% Re ALLOY Ye. M. Savitskiy and Tao Tsu-ts'ung p 18–24 refs (See N63-11528 03-25)

N64-11529 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM AVTOMATYKA (AUTOMATION), VOL. 7, NO. 3, 1962
18 Feb. 1963 81 p refs In ENGLISH
(JPRS-17688; OTS-63-21151) OTS: $2.25

CONTENTS:

1. SELF-ORGANIZING SYSTEM WITH POSITIVE FEEDBACKS O. G. Ivakhnenko p 1–31 refs (See N64-11530 03-09)

2. PROGRAMMING THE PROBLEM OF ESTABLISHING A DIAGNOSIS FOR ELECTRONIC COMPUTERS K. O. Shkabara and S. P. Khozyainova p 32–41 refs (See N64-11531 03-20)

3. THE RULE OF BACK CODE CONVERSION AND ITS APPLICATION TO THE CONSTRUCTION OF CIRCUITS OF DIGITAL CODE CONVERSION O. S. Belima p 42–53 (See N64-11532 03-20)

4. SOME QUESTIONS THAT DETERMINE THE DEVELOPMENT OF CYBERNETICS V. M. Glushkov p 54–63 (See N64-11533 03-16)

5. ANALYSIS OF PERCEPTRONS S. F. Kozubovs'kyy p 64–78 refs (See N64-11534 03-16)

6. SUMMARY OF THE DIRECTIONS OF CYBERNETIC DEVELOPMENT p 79 (See N64-11535 03-16)

N64-11597* National Aeronautics and Space Administration. Goddard Space Flight Center, Grenbelt, Md.

RESULTS OF THE SPACE SCIENCE PROGRAM

Robert Jastrow Repr. from Proc. Am. Phil. Soc., v. 106, no. 1, Feb. 1962 p 82–87 refs

Results of investigations by satellites and space probes are discussed in the following areas: (1) the study of the properties of the earth as a planet, and (2) the study of solar activity and its influence on the interplanetary medium and on the atmosphere of the earth. P.V.E.

N64-11610 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM AVTOMATIKA I TELEMEKHANIKA (AUTOMATION AND TELEMECHANICS) [MOSCOW] VOL. 23, NO. 9, 1962

V. K. Isayev et al 21 Feb. 1963 90 p refs Transl. into ENGLISH of 6 articles p 1117–1140, 1144–1153, 1165–1178, 1237–1242, and 1268–1269

(JPRS-17761; OTS-63-21184) OTS: $2.25

CONTENTS:

1. ON A NON-LINEAR PROBLEM OF OPTIMUM CONTROL. PROBLEM FORMULATION, OPTIMUM CONTROL STRUCTURE, FIRST INTEGRALS V. K. Isayev and V. V. Sonin p 1–20 refs (See N64-11611 03-20)

2. ON THE SOLUTION OF SOME PROBLEMS OF DYNAMIC PROGRAMMING THEORY BY ELECTRONIC COMPUTERS N. T. Bang p 21–36 refs (See N64-11612 03-20)

3. APPLICATION OF GAME THEORY TO SOME PROBLEMS OF AUTOMATIC CONTROL. 2 M. Yu. Gadzhiyev p 37–52 refs (See N64-11613 03-20)

4. METHODS OF CORRECTION OF DYNAMIC ERRORS IN MACHINE-TOOLS WITH PROGRAM CONTROL B. I. Andreychikov p 53–74 refs (See N64-11614 03-17)

5. MINIMIZATION OF LOGICAL FUNCTIONS OF A LARGE NUMBER OF VARIABLES V. D. Kazakov p 75–83 refs (See N64-11615 03-20)

6. CHRONICLE: SEMINAR ON THEORY AND APPLICATION OF DISCRETE AUTOMATIC SYSTEMS R. S. Rutman p 84–87 refs (See N64-11616 03-20)

N64-11647 Committee on Space Research (COSPAR), The Hague (Netherlands)

LIFE SCIENCES AND SPACE RESEARCH

R. B. Livingston, A. A. Imshenetsky, and G. A. Derbyshire, eds. Amsterdam, North-Holland Publ. Co., 1963 195 p refs Proc. of a Session of the 3rd Intern. Space Sci. Symp., Washington, 30 Apr.–9 May 1962

CONTENTS:

PART I: EXOBIOLOGY

1. PERSPECTIVES FOR THE DEVELOPMENT OF EXOBIOLOGY A. A. Imshenetsky (Acad. Sci. USSR) p 3–15 refs

PART II: BASIC STUDIES RELATING TO MANNED SPACE FLIGHT

2. SIGNIFICANCE OF VESTIBULAR ORGANS IN PROBLEMS OF WEIGHTLESSNESS Ashton Graybiel (Naval School of Avia. Med.) p 19–32 refs

3. THE EFFECT OF WEIGHTLESSNESS ON THE CENTRAL NERVOUS SYSTEM OF THE RAT [CONTRIBUTION A L'ETUDE DES EFFETS DE L'APESANTEUR SUR LE SYSTEME NERVEUX CENTRAL DU RAT] R. Grandpierre and F. Violette (Centre d'Enseignement et de Rech. de Méd. Aéron., Paris) p 33–38 refs

4. THE BIOLOGICAL EFFECTS OF HEAVY COSMIC RAY PARTICLES H. J. Curtis (Brookhaven Natl. Lab.) p 39–47 refs

5. ESTIMATES OF RADIATION DOSES IN SPACE ON THE BASIS OF CURRENT DATA T. Foelsche (NASA, Langley Res. Center) p 48–94 refs (See N64-11648 03-28)

6. COMPLETE DOSE ANALYSIS OF THE NOVEMBER 12, 1960 SOLAR COSMIC RAY EVENT A. J. Masley and A. D. Goedeke (Douglas Aircraft Co., Inc.) p 95–109 refs

PART III: MANNED SPACE FLIGHT

7. SOVIET EXPERIMENTS AIMED AT INVESTIGATING THE INFLUENCE OF SPACE FLIGHT FACTORS ON THE PHYSIOLOGY OF ANIMALS AND MAN V. V. Parin and O. G. Gazenko (Acad. Sci. USSR) p 113–127 refs

8. PREPARATION AND RESULTS OF A 24-HOUR ORBITAL FLIGHT G. S. Titov (USSR) p 128–140

9. UNITED STATES EXPERIENCE ON THE UTILIZATION OF MAN'S CAPABILITIES IN A SPACE ENVIRONMENT C. W. Mathews (NASA, Manned Spacecraft Center) p 141–159 refs (See N64-11649 03-14)

10. SUMMARY RESULTS OF THE FIRST UNITED STATES MANNED ORBITAL SPACE FLIGHT J. H. Glenn, Jr. (NASA, Manned Spacecraft Center) p 160–183 ref (See N62-17576 19-01)

11. CHAIRMAN'S ADDRESS H. C. Van de Hulst (Utrecht Obs.) p 184

N64-11651 European Atomic Energy Community, Brussels (Belgium)

ELABORATION OF A PROGRAM FOR SIGNIFICATIONAL ANALYSIS [ELABORATION D'UN PROGRAMME D'ANALYSE DE LA SIGNIFICATION]

M. Detant and A. Leroy Joint Nuclear Research Center, Ispra Estab. (Italy) European Sci. Inform. Process. Center [Jan.] 1963 31 p refs In FRENCH; ENGLISH summary Presented at the 3rd Congr. Intern. de Cybernetique, Namur, Belgium, 11–15 Sep. 1961

(EUR-193.f; CETIS Rept. 20) Available from Belgian American Bank and Trust Co., N.Y., account no. 121.86; 50 Belg. Fr.

The numerous difficulties encountered in the mechanization of signification analysis are due to certain semantic ambiguities. General characteristics are presented of a tool (general diagram) with which to solve these problems. The general diagram is made up of a number of publications, organized in such a way as to obtain the best possible use of the information

they contain. In analyzing this information, two procedures are used—the technique of rules, and the technique of precedents. These procedures are described. Author

N64-11665* National Aeronautics and Space Administration, Washington, D.C.

PROBLEMS OF SPACE BIOLOGY

N. M. Sisakyan, et al Nov. 1963 513 p refs Transl. into ENGLISH from a book "Problemy Kosmicheskoy Biologii" Izd. Akad. Nauk SSSR (Moscow), v. I, 1962
(NASA TT F-174) OTS: $7.00

CONTENTS:

PART I: THEORETICAL AND SURVEY ARTICLES

1. CERTAIN PROBLEMS OF STUDYING AND MASTERING COSMIC SPACE N. M. Sisakyan, V. V. Parin, V. N. Chernigovskiy, and V. I. Yazdovskiy p 3–15 (See N64-11666 03-29)

2. PROBLEMS OF SPACE BIOLOGY N. M. Sisakyan, O. G. Gazenko, and A. M. Genin p 17–27 (See N64-11667 03-16)

3. RADIOBIOLOGICAL PROBLEMS OF SPACE FLIGHTS A. A. Gyurdzhian p 29–118 refs (See N64-11668 03-16)

4. PROBLEMS OF BIOLOGICAL TELEMETRY V. V. Parin, R. M. Bayevskiy, and O. G. Gazenko p 119–132 refs (See N64-11669 03-16)

5. PROBLEMS OF SPACE MICROBIOLOGY AND CYTOLOGY N. N. Zhukov-Verezhnikov, I. N. Mayskiy, V. I. Yasdovskiy, A. P. Pekhov, N. I. Raybakov, et al p 133–151 refs (See N64-11670 03-16)

6. THE POSSIBILITY OF EXISTENCE AND METHODS OF DETECTING EXTRATERRESTRIAL LIFE A. A. Imshenetskiy p 153–160 (See N64-11671 03-16)

7. ON THE PROBLEM OF SUPPLYING THE CREWS OF SPACESHIPS WITH ANIMAL FOODSTUFFS K. S. Akhlebininskiy, V. P. Bychkov, I. A. Il'ina, Yu. I. Kondrat'yev, and A. S. Ushakov p 161–168 refs (See N64-11672 03-16)

PART II: BIOLOGICAL EXPERIMENTS ON SPACESHIPS AND SATELLITES

8. BIOCHEMICAL INVESTIGATIONS OF THE BLOOD AND URINE OF ANIMALS THAT FLEW IN SATELLITES A. A. Gyurdzhian, N. N. Demin, L. T. Tutochkina, M. S. Uspenskaya, and T. A. Federova p 169–178 refs (See N64-11673 03-16)

9. CHANGES IN CERTAIN MORPHOLOGICAL AND BIOCHEMICAL INDICES OF THE PERIPHERAL BLOOD OF ANIMALS AFTER ROCKET FLIGHTS I. I. Kas'yan, Ye. M. Yuganov, and T. S. L'vova p 179–183 refs (See N64-11674 03-16)

10. RESULTS OF INVESTIGATIONS OF SOME INDICES OF THE PERIPHERAL VESSELS IN DOGS DURING AND AFTER SPACE FLIGHT V. V. Yakovlev p 185–189 refs (See N64-11675 03-16)

11. OBSERVATIONS ON THE CONDITIONED REFLEX ACTIVITY OF WHITE RATS SOME CONSIDERABLE TIME AFTER TRAVELLING ON THE SECOND SOVIET SATELLITE L. D. Luk'yanova p 191–200 refs (See N64-11676 03-16)

12. INFLUENCE OF SPACE-FLIGHT FACTORS ON THE BACTERICIDAL ACTIVITY OF THE BODY O. G. Alekseyeva, and A. P. Volkova p 201–209 (See N64-11677 03-16)

13. EFFECT OF SPACE-FLIGHT CONDITIONS IN THE SATELLITE ON THE PRESERVATION OF THE VIABILITY OF CHLORELLA CULTURES V. Ye. Semenenko and M. G. Vladimirova p 211–226 refs (See N64-11678 03-16)

14. EFFECTS OF FLIGHT IN THE SECOND SOVIET SATELLITE ON THE HEMOPOIETIC ORGANS OF ANIMALS M. A. Arsen'yeva, V. V. Antipov, V. G. Petrukhin, T. S. L'vova, N. N. Orlova, and S. S. Il'ina p 227–241 refs (See N64-11679 03-16)

15. EFFECTS OF COSMIC FLIGHT FACTORS ON THE INCIDENCE OF RECESSIVE LETHAL MUTATIONS IN THE X-CHROMOSOME OF DROSOPHILA MELANOGASTER Ya. L. Glembotskiy, E. A. Abeleva, Yu. A. Lapkin, and G. P. Parfenov p 243–254 refs (See N64-11680 03-16)

16. INCIDENCE OF DOMINANT LETHAL MUTATIONS IN DROSOPHILA MELANOGASTER DURING A SATELLITE FLIGHT G. P. Parfenov p 255–258 refs (See N64-11681 03-16)

17. INFLUENCE OF SPACE-FLIGHT FACTORS ON HEREDITY AND DEVELOPMENT IN ACTINOMYCETES AND HIGHER-ORDER PLANTS Ya. L. Glembotskiy, A. A. Prokof'yeva-Belgovskaya, Z. B. Shamina, V. V. Khvostova, S. A. Valeva, et al p 259–271 refs (See N64-11682 03-16)

18. INFLUENCE OF SPACE-FLIGHT CONDITIONS ON SEEDS OF *ALLIUM FISTULOSUM* (SPRING ONION) AND *NIGELLA DAMASCENA* (NUTMEG FLOWER) V. N. Sidorov, and N. N. Sokolov p 273–276 (See N64-11683 03-16)

19. SPACE-FLIGHT FACTORS AND PRIMARY NONDISJUNCTION OF CHROMOSOMES N. P. Dubinin and O. L. Kanavets p 277–282 refs (See N64-11684 03-16)

20. INFLUENCE OF SPACE-FLIGHT FACTORS ON THE LEVEL OF SEROTONIN IN THE BLOOD OF ANIMALS V. S. Shashkov, V. V. Antipov, M. O. Raushenbakh, G. A. Chernov, and V. A. Maslennikova p 283–290 refs (See N64-11685 03-03)

21. DETERMINATION OF THE INDUCED RADIOACTIVITY IN THE SECOND SOVIET ARTIFICIAL SATELLITE V. V. Matveyev, and A. D. Sokolov p 291–293 refs (See N64-11686 03-16)

22. SOME RESULTS OF MEDICAL AND BIOLOGICAL INVESTIGATIONS IN THE SECOND AND THIRD SATELLITES V. V. Antipov, R. M. Bayevskiy, O. G. Gazenko, et al p 295–313 (See N64-11687 03-16)

PART III: BIOLOGICAL EXPERIMENTS CARRIED OUT ON THE SECOND SOVIET SATELLITE (EXPERIMENT WITH THE DOG LAYKA)

23. MEDICAL AND BIOLOGICAL INVESTIGATIONS CARRIED OUT ON SOVIET ARTIFICIAL SATELLITES O. G. Gazenko, V. I. Yazdovskiy and V. N. Chernigovskiy p 315–318 (See N64-11688 03-16)

24. PRESSURIZED CAPSULE FOR AN ANIMAL A. M. Bakhramov and V. I. Yazdovskiy p 319–328 refs (See N64-11689 03-16)

25. RESEARCH APPARATUS B. G. Buylov and R. G. Gryuntal' p 329–338 refs (See N64-11690 03-16)

26. AIR REGENERATING SYSTEM IN A PRESSURIZED CAPSULE A. D. Seryapin p 339–352 refs (See N64-11691 03-16)

27. PREPARATION OF THE ANIMAL PRIOR TO THE EXPERIMENT O. G. Gazenko and V. S. Georgiyevskiy p 353–359 refs (See N64-11692 03-16)

28. SANITARY DEVICES IN PRESSURIZED CAPSULES O. G. Gazenko, A. A. Gyurdzhian and G. A. Zakhar'yev p 361–368 refs (See N64-11693 03-16)

29. FASTENING OF AN ANIMAL IN A PRESSURIZED CAPSULE, FABRIC APPAREL AND DISTRIBUTION OF SENSORS FOR THE REGISTRATION OF PHYSIOLOGICAL FUNCTIONS O. G. Gazenko and A. A. Gyurdzhian p 369–377 refs (See N64-11694 03-16)

30. PROVIDING DOGS WITH FOOD AND WATER UNDER SPACE FLIGHT CONDITIONS I. S. Balakhovskiy, L I. Karpova and S. F. Simpura p 379–392 refs (See N64-11695 03-16)

31. RESULTS OF EXPERIMENTS CARRIED OUT IN SATELLITES I. S. Balakhovskiy, O. G. Gazenko, A. A. Gyurdzhian, A. M. Genin, A. R. Kotovskaya et al p 393–404 refs (See N64-11696 03-16)

PART IV: GROUND EXPERIMENTS, METHODS AND TECHNIQUES

32. THE AMINOACID COMPOSITION OF CHLORELLA—*CHLORELLA PYRENOIDOSA* N. M. Sisakyan, E N Bezinger and M. G. Shaposhnikova p 405–410 refs (See N64-11697 03-16)

33. THE EFFECT OF GENERAL VIBRATION ON THE ANIMAL BODY V. S. Georgiyevskiy and Ye. M. Yuganov p 411–420 refs (See N64-11698 03-16)

34. THE EFFECT OF PROLONGED TRANSVERSE ACCELERATION ON ANIMALS A. R. Kotovskaya and Ye. M. Yuganov p 421–428 refs (See N64-11699 03-16)

35. THE PROBLEM OF THE BIOLOGICAL ACTION OF COSMIC AND SOLAR RADIATIONS IN THE MOUNTAINS V. I. Danileyko p 429–437 refs (See N64-11700 03-16)

36. METHODS OF INVESTIGATING THE BLOOD CIRCULATION OF THE BRAIN UNDER CONDITIONS OF A MODIFIED GRAVITATIONAL FIELD Yu. Ye. Moskalenko, R. M. Bayevskiy, and O. G. Gazenko p 439–443 refs (See N64-11701 03-16)

37. CONTAINERS FOR CERTAIN BIOLOGICAL MATERIALS USED IN EXPERIMENTS IN SPACESHIPS I. V. Baranovskaya and A. A. Gyurdzhian p 445–447 refs (See N64-11702 03-16)

38. ENSURING LIVING CONDITIONS FOR MICE DURING PROLONGED FLIGHT IN SPACESHIPS AND SATELLITES I. V. Baranovskaya and A. A. Gyurdzhian p 449–452 refs (See N64-11703 03-16)

39. METHOD OF "INTEGRATED" PHONOCARDIOGRAPHY R. M. Bayevskiy p 453–455 (See N64-11704 03-16)

40. A TECHNIQUE FOR RECORDING SPHYGMOGRAMS OF DOGS p 457–459 (See N64-11705 03-16)

41. RECORDING OF SEISMOCARDIOGRAMS IN DOGS R. M. Bayevskiy and L. A. Kazar'yan p 461–464 refs (See N64-11706 03-16)

42. THE CHOICE OF LEADS AND THE ANALYSIS OF ELECTROCARDIOGRAMS IN DOGS R. M. Bayevskiy and M. M. Osipova p 465–469 refs (See N64-11707 03-16)

43. THE STUDY OF BIOELECTRIC POTENTIALS AND OXYGEN PRESSURE IN BRAIN TISSUE DURING HYPOXIA Ye. A. Kovalenko and V. B. Malkin p 471–482 refs (See N64-11708 03-16)

44. COORDINATION OF ARBITRARY MOVEMENTS OF A HUMAN BEING IN A CHANGING GRAVITATIONAL FIELD L V. Chkhaidze p 483–495 refs (See N64-11709 03-14)

45. A METHOD OF FASTENING ELECTRODES FOR REGISTERING AN ELECTROCARDIOGRAM DURING MANNED SPACE FLIGHTS N. A. Agadzhanyan, I. T. Akulinichev, K. P. Zazykin, and D. G. Maksimov p 497–506 refs (See N64-11710 03-16)

N64-11711 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

JOURNAL OF APPLIED MECHANICS AND TECHNICAL PHYSICS. SELECTED ARTICLES

V. M. Sarychev et al 3 May 1963 65 p refs Transl. into ENGLISH of 5 articles from Zh. Prik. Mekhan. i Tekhn. Fiz. (Moscow), no. 2, 1962 p 3–13, 20–31, 50–58, and 110–112 (FTD-TT-62-1778/1+2; AD-409-065) OTS: $6.60

CONTENTS:

1. CONVERSION OF KINETIC ENERGY OF A STATIONARY PLASMA STREAM INTO ELECTRICITY WITH ISOTHERMAL RETARDATION OF THE STREAM IN A TRANSVERSE MAGNETIC FIELD V. M. Sarychev p 1–7 refs (See N64-11712 03-24)

2. GENERATION OF ELECTRIC CURRENT BY A PLASMA FLOWING IN A TUBE E. I. Andriankin p 8–18b refs (See N64-11713 03-24)

3. THERMAL IONIZATION AND ELECTRIC CONDUCTIVITY OF SOME COMBUSTION MIXTURES AND PRODUCTS G. S. Aravin and V. P. Shevelev p 19–38d refs (See N64-11714 03-24)

4. INFLUENCE OF THE DIFFUSION OF RADIATING IMPURITIES ON CONVECTIVE HEAT EXCHANGE A. N. Rumynskiy p 39–56 refs (See N64-11715 03-13)

5. EFFECT OF RATE OF HEAT RELEASE IN ELECTRIC EXPLOSIONS IN WATER ON THE DISTRIBUTION OF THE EXPLOSION ENERGY M. I. Vorotnikova p 57–62 refs (See N64-11716 03-11)

N64-11717* National Engineering Science Co., Houston, Tex.

INVESTIGATION OF RELATIONS BETWEEN SOLAR VARIATIONS AND WEATHER ON EARTH AS SHOWN BY SATELLITE DATA Final Report

John C. Freeman, Jr., Leon F. Graves, and W. H. Portig Oct. 1963 176 p refs

(NASA Contract NASw-724)

(NASA CR-52682; SN-140) OTS: $12.50 ph, $5.48 mf

CONTENTS:

PART A. SOLAR WEATHER AND EARTH WEATHER IN AUGUST AND SEPTEMBER 1961 AS SHOWN BY SATELLITES AND OTHER OBSERVATIONS J. C. Freeman, Jr., L. F. Graves, and W. H. Portig p 1–29 refs (See N64-11718 03-28)

PART B. A MODEL OF THE ATMOSPHERE FOR INVESTIGATING THE INTERACTION WITH THE SUN THROUGH THE SOLAR WIND J. C. Freeman, Jr. and L. F. Graves p 30–53 refs (See N64-11719 03-28)

APPENDIX 1. THICKNESS OF A SHOCK WAVE IN THE SOLAR WIND J. C. Freeman, Jr. p 1-1–1-7 refs (See N64-11720 03-28)

APPENDIX 2. A POSSIBLE OSCILLATION OF THE WINDS IN THE EQUATORIAL STRATOSPHERE WITH A PERIOD OF 24 TO 27 MONTHS J. C. Freeman, Jr. p 2-1–2-15 refs (See N64-11721 03-21)

APPENDIX 3. A POSSIBLE INERTIAL OSCILLATION OF THE EQUATORIAL STRATOSPHERE J. C. Freeman, Jr. p 3-1–3-7 refs (See N64-11722 03-21)

APPENDIX 4. A THEORY FOR ATMOSPHERIC CROSS SECTIONS J. C. Freeman, Jr. p 4-1–4-41 refs (See N64-11723 03-21)

APPENDIX 5. SELECTION OF KEY DAYS F. Graves p 5-1–5-7 refs (See N64-11724 03-21)

APPENDIX 6. INDICES OF SOLAR ACTIVITY L. F. Graves p 6-1–6-5 refs (See N64-11725 03-28)

APPENDIX 7. A MODEL OF EQUATORIAL FLOW J. C. Freeman, Jr. p 7-1–7-17 refs (See N64-11726 03-21)

APPENDIX 8. THOUGHTS DEVELOPED AFTER A DISCUSSION OF SOLAR WEATHER WITH THE STAFF MEMBERS OF THE SOUTHWEST CENTER FOR ADVANCED STUDIES J. C. Freeman, Jr. p 8-1–8-7 refs (See N64-11727 03-28)

N64-11729* National Aeronautics and Space Administration, Washington, D.C.
STATEMENT OF DR. ROBERT C. SEAMANS, JR., ASSOCIATE ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, BEFORE THE COMMITTEE ON SCIENCE AND ASTRONAUTICS, HOUSE OF REPRESENTATIVES
Robert C. Seamans, Jr. [1963] 96 p

This statement describes the content of NASA programs, the direction in which the programs must move, and the budget required to progress as soundly and as rapidly as possible toward the Nation's objectives in space. The following programs are covered: (1) a general description of NASA programs and centers; (2) manned spaceflight; (3) space science; (4) meteorological and communications satellites; (5) advanced research and technology; (6) tracking and data acquisition; (7) advanced studies related to future missions; and (8) organization and staffing. I.v.L.

N64-11732* National Aeronautics and Space Administration, Washington, D.C.
IMPACT OF NASA PROGRAM ON INDUSTRY News Release
James E. Webb 6 Dec. 1963 16 p Presented at the Natl. Assoc. of Mfg., 68th Ann. Congr. of American Ind., New York, 6 Dec. 1963
Available from NASA. Office of Scientific and Technical Information, Wash., D.C.

In an address, James E. Webb, Administrator of NASA, discussed the challenges of space research and development, and the manner in which the national resources in Government, industry, and the universities are organized to achieve U.S. leadership in space. R.T.K.

N64-11762 Raytheon Co., Waltham, Mass. Equipment Div.
PERTEACH, THE DEVELOPMENT OF EXPERIMENTAL PROGRAMS FOR AUTOMATED TRAINING IN DECISION MAKING. HANDBOOK FOR PERTEACH COURSE ADMINISTRATORS
G. J. Rath, R. E. Hannan, and M. L. Weiss L. G. Hanscom Field, Bedford, Mass., Decision Sci. Lab. Jul. 1963 59 p refs (Contract AF 19(628)-365)
(ESD-TDR-63-606; AD-421776)

Statistics compiled from field testing of the PERTeach volumes are presented with pertinent personnel data. Forms, questionnaires, and program outlines are presented with their descriptions and an analysis of usage. Data contained were used to modify the course in accord with the practice of course modification based on field test results. Author

N64-11780* National Aeronautics and Space Administration, Washington, D.C.
ORGANIZING FOR THE CONQUEST OF SPACE News Release
Brainerd Holmes and George M. Low [1962] 21 p Address before the Inst. of Aerospace Sci. and NASA, St. Louis, 30 Apr. 1962
Available from NASA. Office of Scientific and Technical Information, Wash, D.C.

In an address delivered by George M. Low, Director, Spacecraft and Flight Missions, NASA, for Dr. Brainerd Holmes, he states that a program designed to land a man on the moon and bring him back to earth will focus U.S. scientific and technical talents on a task that, by its very nature, will lead to a general advancement in technology. This advancement will lead, in turn, to progress in all fields. Mr. Low also discusses the organization of NASA, in particular, that of the office of Manned Space Flight. D.M.B.

N64-11795* National Aeronautics and Space Administration, Washington, D.C.
OFFICE OF APPLICATIONS
Morton J. Stoller Jun. 1962 79 p Presented at the Natl. Acad. Sci. Space Sci. Summer Study, Iowa State U., Iowa City, Jun. 1962
(NASA TM X-51277) OTS: $7.60 ph, $2.57 mf

This office has three major areas of activity—meteorological systems, the communication systems, and future application. A specific line of satellite development is already underway in meteorological systems. In communications, it is quite probable that the ultimate system may use the synchronous orbit satellite. The experimental work on the synchronous orbit satellite will be used in the development and evaluation of techniques, which if proven feasible, should make it possible to realize an operational system within a reasonable length of time. Since the development of the synchronous orbit satellite is a difficult technical development, in the interim, efforts leading to the establishment of a communications satellite system using low or intermediate altitude active repeaters have been initiated. Also, investigations into the construction and utility of passive satellites is continuing. The present effort in the area of future application is to locate within NASA's research and development program those new techniques, processes, and devices which can be of benefit to the civilian economy. I.v.L.

N64-11813* National Aeronautics and Space Administration, Washington, D.C.
NASA'S QUALITY PROGRAM
Howard M. Weiss [1962] 23 p refs Presented at Joint Meeting of Boston Sections of the Inst. of Radio Eng. (PGRQC) and the Soc. for Nondestructive Testing, 18 Oct. 1962
(NASA TM X-51276) OTS: $2.60 ph, $0.89 mf

The importance of quality control to space achievement is discussed. The general sequence of reliability and quality events, from the preliminary idea to contract award, is presented. Detailed quality specifications are either cited in the procurement or are required to be generated by the contractor as part of the research and development work. Some highlights of NASA's quality publications are reviewed, and the need for carefully planned and controlled tests in order to obtain valid and meaningful results is stressed. Using these procedures and documents, NASA expects to obtain reliable flight hardware on time and within budget costs through cooperation with the industry team. M.P.G.

N64-11814* National Aeronautics and Space Administration, Washington, D.C.
NOTES OF THE COSTS OF THE UNITED STATES SPACE PROGRAM
Addison M. Rothrock [1962] 41 p Presented at a Joint Meeting of the Royal Aeronautical Soc. and the British Interplanetary Soc., London, 13 Feb. 1962
(NASA TM X-51275) OTS: $4.60 ph, $1.43 mf

NASA annual budgets are presented for the fiscal years 1961 and 1962. Also, the budget proposed by the President for 1963 is presented. The budget for the space sciences for the year 1961 was $260 million; for 1962, $395 million; proposed for 1963, $570 million. The budget for spacecraft applications for 1961 was $58 million; for 1962, $107 million; proposed for 1963, $140 million. The budget for manned spaceflight for 1961 was $423 million; for 1962, $806 million; proposed for 1963, $2507 million. The budget for tracking and data reception for 1961 was $73 million; for 1962, $125 million; proposed for 1963, $213 million. The budget for vehicle research and technology for 1961 was $152 million; for 1962, $239 million; proposed for 1963, $513 million. I.v.L.

N64-11851 Joint Publications Research Service, Washington, D.C.
SOVIET REPORTS ON SPACE MEDICINE AND BIOLOGY
30 Apr. 1963 99 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), v. 28, no. 1, 1963 p 15–23, 24–39, 138–145, and 152–156 (JPRS-18985; OTS-63-21723) OTS: $2.25

CONTENTS:

1. EXPERIMENTAL STUDIES IN COSMIC PHYSIOLOGY P. V. Vasil'yev, A.D. Voskresenskiy, and O. G. Gazenko p 1–20 refs (See N64-11852 03-14)

2. REACTIONS OF THE CARDIOVASCULAR AND RESPIRATORY SYSTEMS OF ANIMALS DURING FLIGHTS IN HERMETIC CABINS OF ROCKETS UP TO AN ALTITUDE OF 212 KM I. I. Kas'yan p 21–54 refs (See N64-11853 03-16)

3. TENTH EUROPEAN CONGRESS ON AVIATION AND SPACE MEDICINE A. A. Gyurdzhian and A. V. Yeremin p 55–81 refs (See N64-11854 03-01)

4. SESSION OF THE DEPARTMENT OF BIOLOGICAL SCIENCES OF THE ACADEMY OF SCIENCES USSR DEVOTED TO THE 5TH ANNIVERSARY OF THE LAUNCHING OF THE 1ST ARTIFICIAL EARTH SATELLITE G. P. Mikhaylovskiy p 82–96 refs (See N64-11855 03-01)

N64-11854 Joint Publications Research Service, Washington, D.C.
TENTH EUROPEAN CONGRESS ON AVIATION AND SPACE MEDICINE
A. A. Gyurdzhian and A. V. Yeremin *In its* Sov. Rept. on Space Med. and Biol. 30 Apr. 1963 p 55–81 refs (See N64-11851 03-01) OTS: $2.25

A brief report of papers, films, and demonstrations presented at the Tenth European Congress on Aviation and Space Medicine is presented. P.V.E.

N64-11855 Joint Publications Research Service, Washington, D.C.
SESSION OF THE DEPARTMENT OF BIOLOGICAL SCIENCES OF THE ACADEMY OF SCIENCES USSR DEVOTED TO THE 5TH ANNIVERSARY OF THE LAUNCHING OF THE 1ST ARTIFICIAL EARTH SATELLITE
G. P. Mikhaylovskiy *In its* Sov. Rept. on Space Med. and Biol. 30 Apr. 1963 p 82–96 refs (See N64-11851 03-01) OTS: $2.25

A brief review is given of papers presented at the session. Subjects covered included security of cosmic flights, effects of cosmic flight factors on living organisms, and radiobiology. P.V.E.

N64-11856 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS ON HYGIENE AND SAFETY
6 May 1963 12 p refs Transl. into ENGLISH from Gigiena Truda i Profess. Zabolevaniia (Moscow), no 2, 1963 p 24–29 (JPRS-19068; OTS-63-21756) OTS: $0.50

CONTENTS:

1. ULTRA-HIGH-FREQUENCY ELECTROMAGNETIC WAVES OF THE DECKS OF MERCHANT SHIPS Ye. L. Kulikovskaya p 1–5 (See N64-11857 03-08)

2. HYGIENIC EVALUATION OF WORKING CONDITIONS IN WORK WITH HIGH-FREQUENCY CURRENTS L. T. Frolova p 6–9 refs (See N64-11858 03-16)

N64-11877 Advisory Group for Aeronautical Research and Development, Paris (France)
PROCEEDINGS OF THE TWELFTH AGARD GENERAL ASSEMBLY
B. J. Driscoll, ed. Sep. 1962 p 162 refs Presented at the Conf. Commemorating the Tenth Anniv. of the Founding of AGARD, Paris, 11–12 Jul. 1962

CONTENTS:

FOREWORD

NORTH ATLANTIC TREATY ORGANIZATION

PART I: OFFICIAL OPENING AND GREETINGS p 3–20
PART II: ORIGIN AND GOALS OF AGARD T. von Karman (AGARD) p 21–24
PART III: HISTORICAL REVIEW OF AGARD D. L. Putt (USAF) et al p 27–42
PART IV: TECHNICAL SESSIONS—MANNED FLIGHT SYSTEMS: PAST, PRESENT, FUTURE

1. FLUID DYNAMICS ASPECTS L. F. Nicholson (Min. of Aviation, Gt. Brit.) p 45–48 (See N64-11878 03-01)

2. PROPULSION ASPECTS J. Surugue (Office Natl. d'Etudes et de Rech. Aéron., France) p 49–69 (See N64-11879 03-27)

3. STRUCTURES AND MATERIALS ASPECTS R. V. Rhode (NASA, Wash.) p 71–83 (See N64-11880 03-34)

4. AVIONICS ASPECTS E. J. Vassy (Paris U.) p 85–91 (See N64-11881 03-12)

5. AERO-MEDICAL ASPECTS W. K. Stewart (RAF, Farnborough, Gt. Brit.) p 93–109 refs (See N64-11882 03-16)

6. DOCUMENTATION ASPECTS J. A. Schuller (Armed Forces Tech. Inform. Center, Netherlands) p 103–109 refs

7. FLIGHT MECHANICS ASPECTS W. C. Williams (NASA, Manned Spacecraft Center) p 111–115 (See N64-11883 03-03)

8. PILOT EXPERIENCE WITH THE X-15 AIRPLANE R. A. Rushworth (AF Flight Test Center, Edwards AFB) p 117–123 (See N64-11884 03-05)

9. ADAPTATION OF AIRCRAFT TESTING PRINCIPLES TO MANNED SPACE FLIGHT W. C. Williams p 125–154 (See N64-11885 03-04)

N64-11878 Gt. Brit. Ministry of Aviation, London
FLUID DYNAMICS ASPECTS
L. F. Nicholson *In* Advisory Group for Aeron. Res. and Develop. Proc. of the 12th AGARD Gen. Assembly Sep. 1962 p 45–48 (See N64-11877 03-01)

The accomplishments of AGARD'S Fluid Dynamics Panel (and of its predecessor, the Wind Tunnel Panel) over the past 10 years are reviewed. Advances in electronics, aerodynamics, hypersonics, vertical takeoff, and separated flow characterized this decade. The work of AGARD in promoting the research upon which many of the achievements were based and in fostering international cooperation among scientists on the personal level is stressed. In view of the broad range of technical possibilities, the choice of systems to develop in the immediate future can be assisted by AGARD studies of aircraft systems, the place of man in such systems, and how best to direct and concentrate the research resources of the combined membership. M.P.G.

N64-11896* National Aeronautics and Space Administration, Washington, D.C.
SCIENCE AND TECHNOLOGY — KEYS TO ECONOMIC PROGRESS

James E. Webb 17 Jun. 1962 25 p Address Delivered at the 61st Commencement Exercises of Northeastern U., Boston, 17 Jun. 1962
(NASA TM X-51269) OTS: $2.60 ph, $0.95 mf

The events that have brought us to the present stage of development in science and technology, the history of flight, rocket development, and spaceflight, along with the expenditures of the government, universities, and industry for scientific research and development are discussed in an address by James E. Webb, Administrator of NASA. He stressed that the inventions and innovations which make the best use of the newest advances in the new physical science areas can come only from intellects which have acquired a sophisticated, complete understanding of the basic laws of nature as they unfold at a rapid rate. This means a university trained, and frequently university based, mind is of greatest importance. R.T.K.

N64-11912 Federal Aviation Agency, Washington, D.C. Systems Research and Development Service
SUMMARY PRESENTATION OF THE SYSTEMS RESEARCH AND DEVELOPMENT SERVICE PROGRAM
Jan. 1963 121 p

The Systems Research and Development Service of the Federal Aviation Agency is devoting its concentrated effort toward developing the design for the National Airspace System. This design is a comprehensive plan for the use of the now crowded airspace. This report discusses the status of program areas concerning air traffic, navigation, airports, and weather. I.v.L.

N64-11922 Joint Publications Research Service, Washington, D.C.
SCIENTIFIC RESEARCH AND ITS PRACTICAL APPLICATION
V. Lashkarev (Akad. Nauk Ukr. SSSR) 20 Dec. 1963 7 p Transl. into ENGLISH of an article "Kratchaishii Put" from Izv. (Moscow), 15 Oct. 1963 p 5
(JPRS-22398; OTS-64-21085) OTS: $0.50

The route from science to practical application is long because there is not sufficient clearness in the definition of the responsibilities of the Academies of Sciences, State Committees, and Councils of National Economy. Also, the interdepartmental barriers are too great. I.v.L.

N64-11965 Joint Publications Research Service, Washington, D.C.
JOURNAL OF ENGINEERING PHYSICS [MINSK] VOL. 6, NO. 6, JUNE 1963 [INZHENERNO-FIZICHESKIY ZHURNAL]
N. I. Nikitenko et al 17 Dec. 1963 212 p refs Transl. into ENGLISH of 18 articles
(JPRS-22321; OTS-62-21038) OTS: $3.50

CONTENTS:

1. EXPERIMENTAL INVESTIGATION OF HEAT EXCHANGE N. I. Nikitenko p 1–11 refs (See N64-11966 03-23)

2. APPLICATION OF THE THERMODYNAMICS OF IRREVERSIBLE PROCESSES TO THE FLOW OF A MULTICOMPONENT LIQUID THROUGH POROUS MEDIA R. G. Mokadam p 12–26 refs (See N64-11967 03-11)

3. EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF THE VIBRATION OF A SPHERE OF HEAT AND MASS EXCHANGE IN A TURBULENT STREAM OF AIR S. S. Chervyakov p 27–34 refs (See N64-11968 03-13)

4. SINGULARITIES OF SUPERSONIC FLOWS IMMEDIATELY ADJACENT TO A TRANSONIC REGION A. A. Gukhman, A. F. Gandel'sman, L. N. Naurits, and V. V. Usanov p 35–47 refs (See N64-11969 03-11)

5. HEAT EXCHANGE OF A DISK AND A SCREEN WITH NONUNIFORM TEMPERATURE DISTRIBUTION OF THE HEAT-EXCHANGE SURFACES V. M. Kapinos p 48–63 refs (See N64-11970 03-13)

6. CONCERNING THE EQUATION OF STATE OF HELIUM A. S. Predvoditelev p 64–76 refs (See N64-11971 03-23)

7. THE EQUATION OF STATE AND THERMODYNAMIC PROPERTIES OF OXYGEN P. M. Kessel'man p 77–86 refs (See N64-11972 03-23)

8. A DIAGRAM OF THE PRODUCTS OF GAS COMBUSTION WITH ALLOWANCE FOR DISSOCIATION G. P. Verkhivker, N. G. Zubatov, and P. A. Kotlyarevskiy p 87–96 refs (See N64-11973 03-26)

9. AN EXPERIMENTAL INSTALLATION FOR STUDYING THE VAPOR PRESSURE OF ALKALI METALS AT HIGH TEMPERATURES E. E. Shpil'rayn and A. M. Zvereva p 97–102 refs (See N64-11974 03-10)

10. A GENERALIZATION OF CERTAIN STUDIES OF RADIATION HEAT-EXCHANGE IN A FLAME FURNACE A. D. Klyuchnikov and Ye. Ye. Agarkov p 103–115 refs (See N64-11975 03-13)

11. THE INFLUENCE OF HEATING VELOCITY ON THE KINETICS OF CALCINING MINERAL SUBSTANCES G. A. Kasparyan p 116–127 refs (See N64-11976 03-13)

12. THE MECHANISM OF THE COMBUSTION OF POWDERS P. F. Pokhil and V. M. Mal'tsev p 128–137 refs (See N64-11977 03-26)

13. EFFICIENCY INDICES OF TRANSFER PROCESSES I. T. El'perin p 138–149 refs (See N64-11978 03-13)

14. THE KINETICS OF DRYING LUMPY MATERIALS IN A MOVING LAYER Yu. A. Berman p 150–162 refs (See N64-11979 03-13)

15. A STUDY OF THE UNIFORMITY OF MOTION OF A DISPERSION LAYER IN PARALLEL CHANNELS Z. R. Gorbis and Yu. L. Tonkonogiy p 163–173 refs (See N64-11980 03-11)

16. THE FLOW OF A RESILIENT-VISCOUS LIQUID IN PIPES OF ROUND, RING AND SLIT CROSS-SECTION A. I. Lukomskaya p 174–187 refs (See N64-11981 03-02)

17. THE TRANSFER OF ENERGY IN A GRAY MEDIUM P. K. Konakov p 188–202 refs (See N64-11982 03-13)

18. NIKOLAY GUR'YEVICH CHETAYEV N. G. Chetayev p 203–208

N64-12081 General Dynamics/Fort Worth, Tex.
DATA COLLECTION OF UNPUBLISHED MATERIALS INFORMATION Second Quarterly Progress Report, 7 Aug. 1963-6 Nov. 1963
C. E. King 18 Nov. 1963 9 p
(Contract AF 33(657)-11214)
(FPR-009, Issue 2; AD-423747)

The status of the collection and review of previously unreported data generated by General Dynamics of Fort Worth is presented. Fifteen reports have been selected for distribution. Topics of discussion include the testing of a space radiator, ceramic structural panels, specific heat of nitrogen, phase changes in ice solutions, magnetic shielding and superconductivity, electrochemistry, and stress corrosion cracking. J.E.T.

N64-12087* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOSSARY OF TERMS USED IN THE EXPLORATION OF SPACE
[Jul. 1963] 31 p refs
(NASA TM X-51299; NASA X-202-63-140) OTS: $3.60 ph, $1.13 mf

N64-12098* National Aeronautics and Space Administration, Washington, D.C.
FIRST FIVE YEARS OF NASA, A CONCISE CHRONOLOGY NASA Historical Report
Molly Holme 17 Sep. 1963 77 p
(NASA TM X-51333) OTS: $7.60 ph, $2.51 mf

This chronology includes the following: (1) highlights of NASA's administrative, organizational, and policy experience; (2) major NASA milestones in space science and technology; (3) representative items reflecting contributions of NASA offices, centers, and individuals; (4) major policy statements by President Kennedy and NASA administrators; and (5) summary items reflecting evolution, growth, and accomplishments of NASA. R.T.K.

N64-12218 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio
TROUBLESHOOTING STRATEGIES AND UTILITY FOR RISK
Kirk A. Johnson Oct. 1963 45 p refs
(AMRL-TDR-63-92; AD-424506)

Sixty-one subjects were administered a battery of tasks which consisted of a paper and pencil troubleshooting task, a selective concept formation task, ten tasks designed to provide indexes of utility for risk, and four tasks of quantitative intellectual ability. Both the troubleshooting and concept formation tasks were scored for: (1) premature attempts at final solutions; (2) totally redundant information seeking moves; and (3) the average expected reduction in uncertainty provided by moves other than those considered above. In spite of relatively high reliabilities, parallel indexes of problem-solving efficiency were almost completely independent of one another. The various indexes of utility for risk appeared to be almost completely independent of one another. No single index, whether of utility for risk or intellectual ability, accounted for more than 20% of the variability on any of the indexes of problem-solving efficiency. Author

N64-12222 Army Missile Command, Huntsville, Ala.
AUTOMATIC DATA PROCESSING TECHNIQUES FOR DETERMINING ENERGY-MANAGEMENT RELIABILITY
William D. Guthrie and J. S. Sturdivant 6 Nov. 1963 20 p
(RK-TR-63-23; AD-424992)

Two techniques for automated statistical evaluation of rocket motor performance envelopes have been developed—the absolute and the approximate techniques. This report describes the logic for the absolute technique, which is a mathematically accurate method applicable to a large, fast computer, such as the IBM 7090. The report also describes in detail an LGP-30 computer program for the analytical study of pressure time or thrust time data using the approximate technique. The approximate technique is designed for use with relatively slow, limited-storage computers, such as the LGP-30 and the RPC-4000. The approximate and absolute techniques make possible quality control and the evaluation of the effects of solid-propellant processing variations on performance reproducibility. Author

N64-12324 Frankford Arsenal, Philadelphia, Pa. Research and Development Group
DEVELOPMENT OF ROCKET CATAPULT XM13
N. J. Waecker Aug. 1963 69 p refs
(R-1689; AD-423907)

XM9 Catapults were modified for use with the TRECOM LW-1 seat. These modifications consisted of: (1) change in nozzle angle from 52° to 36° 20'; (2) change in rocket grain length from 33.4 inches to 24.5 inches; and (3) change in catapult charge to permit operation with lightweight seats. The modified catapult was designated Catapult, Aircraft Personnel, XM13. A test program was conducted consisting of static, free-flight, and tower firings with human subjects. Author

02 AERODYNAMICS OF BODIES, COMBINATIONS, AND INTERNAL FLOW

Includes aerodynamics of channels, cowls, ducts, ejectors, nozzles, etc. *For related information see*: 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 11 Fluid Mechanics.

N64-11450 General Dynamics/Astronautics, San Diego, Calif. Space Science Lab.
FLOW SIMULATION IN HYPERSONIC WIND TUNNELS
Jerome J. Brainerd Arnold Eng. Develop. Center, Nov. 1963 77 p refs
(Contract AF 40(600)-971)
(AEDC-TDR-63-243; AD-423102)

Calculations were made to determine the test section conditions at three design points in a proposed AEDC Wind Tunnel, including the effects of nonequilibrium chemical reactions. Further calculations were made to determine quantitatively the effects of various parameters on nonequilibrium nozzle flows. Wedge studies were made to determine the effects of oxygen dissociation on the flow in the free stream. Due to the thick, and possibly merged, boundary layer under the conditions investigated, no conclusive results were obtained. In calculations along the stagnation line of a sphere, however, it was found that free-stream oxygen dissociation had little effect on the flow for the case considered. Author

N64-11743* United Aircraft Corp., East Hartford, Conn.
INVESTIGATION OF NONEQUILIBRIUM FLOW EFFECTS IN HIGH EXPANSION NOZZLES Final Report
V. J. Sarli 20 Sep. 1963 182 p refs
(NASA Contract NASw-366)
(NASA CR-52921; B910056-12) OTS: $13.00 ph, $5.66 mf

Order-of-magnitude calculations were carried out for six propellant combinations to determine the relative effects on nozzle performance of lack of equilibrium in the nozzle due to continuing reaction or recombination lag, thermodynamic relaxation, velocity and thermal lags associated with two-phase flow, condensing flow, and heat transfer to a wall with a nonequilibrium boundary layer. A machine computational program was perfected to treat the one-dimensional flow of a reacting gas mixture in a variable area passage. Using the refined program, an investigation was performed to determine the effects of throat contours, freezing point locations, constant entropy assumptions, combustion efficiency, and vibrational relaxation on the theoretical performance of a nozzle designed for use with the H_2–O_2 propellant combination. Two additional machine programs for constructing two-dimensional and axisymmetric flows with finite chemical kinetics have been completed. Author

N64-11875 France. Ministère de l'Air, Paris
A CONTRIBUTION TO THE STUDY OF FLOW IN A SIX DEGREE CONICAL DIFFUSER [CONTRIBUTION A L'ETUDE DE L'ECOULEMENT DANS UN DIFFUSEUR A SIX DEGRES]

Francoise Villeneuve Paris, Serv. de Doc. et d'Inform. Tech. de l'Aeron. (SDIT), Aug. 1963 80 p refs In FRENCH
(*Its* Publ. Sci. et Tech. 397) Available from SDIT, 2, Ave. de la Porte-d'Issy, Paris (15e)

The object of this study is to show the evolution of different parameters characteristic of the flow in a diffuser between the inlet and the exit. The following are considered: static wall pressures; the coefficients of pressure recovery; speed profiles; higher characteristics of boundary layers; the Reynolds number of the flow; the turbulent intensity; and the turbulence spectra. Trans. by M.P.G.

N64-11886 France. Office National d'Etudes et de Recherches Aerospatiales, Chatillon-sous-Bagneux
CURRENT RESEARCH ON THE PROBLEM OF BASE PRESSURE [RECHERCHES RECENTES SUR LE PROBLEME DE LA PRESSION DE CULOT]
Pierre Carrière 18 Feb. 1963 23 p refs Presented at the Conf. on Fluid Mechanics, Paris, 18 Feb. 1963
(ONERA-TP-18)

A useful method for treating the fundamental problems of base-pressure theory is presented. The method is based on schematic representation of general equations for which the coefficients of turbulent mixing are unknown. Using this scheme, the problem is reduced to the determination of the parameter σ and the verification of the fact that the temperature distribution in the mixing zone corresponds to the hypothesis $P_{ft} = 1$. Values of σ are well known for incompressible flow up to about Mach 2.5; beyond this point, the experimental results become more and more scattered as the Mach number is increased. Therefore, this method can be used to predict flow behind the body in the supersonic regime, but further research is necessary before it is applied to hypersonic fields. M.P.G.

N64-11897* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
SHOCK ENVELOPES OF BLUNT BODIES AT LARGE ANGLES OF ATTACK
George E. Kaatari Washington, NASA, Dec. 1963 43 p refs
(NASA-TN-D-1980) OTS: $1.25

A method is presented for determining shock-wave shapes and stagnation-point locations for spherically blunted bodies at large angles-of-attack. The method is applicable to perfect gas flows and equilibrium flow of real gases. The effects of altitude and velocity enter solely through the normal-shock density ratio appropriate to the flight conditions. The results given by the method are compared with experimental values, and are shown to agree satisfactorily. Author

N64-11981 Joint Publications Research Service, Washington, D.C.
THE FLOW OF A RESILIENT-VISCOUS LIQUID IN PIPES OF ROUND, RING AND SLIT CROSS-SECTION
A. I. Lukomskaya *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 174–187 refs (See N64-11965 03-01) OTS: $3.50

In analyzing the flow of a resilient-viscous liquid in pipes of round, ring and slit cross section, a model is used which is a successive union of the Voigt–Kelvin models and Newtonian flow. An expression is derived for space velocity of the flow from qualitatively supporting data on the extrusion of various mixtures from circular capillaries. Author

N64-12050 ARO, Inc., Arnold Air Force Station, Tenn.
WIND TUNNEL TESTS OF FIVE CONFIGURATIONS OF THE FDN 5810-T-7 SLED FORWARD VEHICLE AT TRANSONIC SPEEDS
John A. Black Arnold Eng. Develop. Center, Nov. 1963 25 p refs
(Contract AF 40(600)-1000)
(AEDC-TDR-63-252; AD-423979)

Force and pressure distribution tests were conducted on five configurations of a 1/28-scale model of the FDN 5810-T-7 sled forward vehicle in the Aerodynamic Wind Tunnel, Transonic (1T) to determine normal-force and axial-force characteristics in the transonic speed range. The tests were conducted at Mach numbers from 0.50 to 1.45, and Reynolds numbers from 1.7 to 2.5 million based on model length. The results show that, of the components whose effects were evaluated, forward slipper-beam shape had the largest effect on forward slipper-beam normal-force loadings, and a sled top fairing had the largest effect on aft slipper-beam normal-force loadings. The nose shape of the sled had no effect on aerodynamic characteristics. Author

N64-12057 David Taylor Model Basin, Washington, D.C. Aerodynamics Lab.
WIND-TUNNEL TESTS OF A JET-STREAM SPOILER TO IMPROVE THE SEPARATION CHARACTERISTICS OF A STORE CARRIED BENEATH THE WING OF HIGH-SPEED AIRCRAFT
Richard M. Hartley and Earl F. Ryan Sep. 1963 45 p refs
(DTMB-AERO-1059; AD-425173)

Wind-tunnel tests at Mach numbers of 0.55 to 0.90 were conducted on a jet-stream spoiler in a 0.05-scale aircraft model which carried an underslung store. The jet-stream spoiler was a compressed-air jet directed out into the wind stream from an aerodynamic surface. This jet device was placed with the nozzle directed from the aircraft lower wing surface onto the rear portion of the store. The purpose of the tests was to improve the release characteristics of the store by alleviating the large negative pitching moments which occurred on the carried store. The test results showed that the small jet-stream spoiler reduced the store pitching moment magnitude only slightly. However, some spoiler configurations did reduce the positive store normal force to zero or negative values, and this could improve the store separation characteristics. Author

N64-12073 ARO, Inc., Arnold Air Force Station, Tenn.
AN INVESTIGATION OF THE DEPLOYMENT CHARACTERISTICS AND DRAG EFFECTIVENESS OF THE GEMINI PERSONNEL DECELERATOR AT SUBSONIC AND SUPERSONIC SPEEDS, PHASE II
Warren E. White and Charles D. Riddle Arnold Eng. Develop. Center Dec. 1963 28 p refs
(Contract AF 40(600)-1000)
(AEDC-TDR-63-255)

The aerodynamic performance of ballute decelerators mounted to a model support strut and to a rigid manikin was investigated at Mach numbers 0.55, 1.73, and 1.92 and dynamic pressures from 150 to 310 psf. Deployment and inflation characteristics, drag and stability data, and data to isolate manikin wake interference effects were obtained. The investigation was conducted in the Propulsion Wind Tunnel, Supersonic (16S). A total of eight deployments were made. The performance criteria of 60 sec of sustained full inflation for the ballutes deployed from the strut and 120 sec for the ballutes deployed from the manikin were not met in any of the deployments. Author

N64-12208 Rome Air Development Center, Griffiss AFB, N.Y.
COMPUTER PROGRAM FOR BLUNT-NOSED RE-ENTRY BODIES
William L. Finley Nov. 1963 54 p refs
(RADC-TDR-63-412; AD-424962)

The electronic computer program presented is one of several that have been created to aid in quickly finding large numbers of solutions to the problem of propagating an EM signal at normal incidence through the plasma sheath upon a wide variety of hypersonic bodies of many sizes and shapes, traveling at speeds of 10,000 to 40,000 fps at altitudes from sea level to 350,000 ft. The objective of the computer program is to provide numerical information upon the aerothermodynamic and electronic characteristics of the plasma sheath which extends well beyond the boundary layer into the inviscid flow field on blunt nosed bodies, and to provide unsophisticated numerical estimates of EM signal loss through the plasma sheath in db, due to reflection and absorption, for a plane wave at normal incidence to a single interface model of the plasma sheath. Author

N64-12233 Avco-Everett Research Lab., Everett, Mass.
HYPERSONIC CONE WAKE VELOCITIES OBTAINED FROM STREAK PICTURES
W. K. Washburn, A. Goldburg, and B. W. Melcher, II Sep. 1963 12 p refs
(Contracts AF 04(694)-33 and DA-19-020-AMC-0210; Proj. Defender)
(BSD-TDR-63-199; AMP 122; AD-422525)

Cone wake velocity data have been obtained from drum camera photographs by graphically measuring the path of the individual luminous streaks. The measured values were compared with the calculations of Hromas and Lees and Lien, Erdos and Pallone for the time averaged values of velocity in the turbulent wakes of cones. The experimental data fall meaningfully close to the theoretical calculations, both having values for V_{Wake}/V_{Body} of the order of 0.1 in the region $10 \leq x/d \leq 20$. This value is significantly below the turbulent sphere wake results, where V_W/V_B is approximately equal to 0.3, in the same region of interest. Author

03 AERODYNAMICS OF WINGS, ROTORS, AND CONTROL SURFACES

Includes ailerons; airfoil sections; cascades; fans; flaps; propellers; rotors; slats; spoilers; etc. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 11 Fluid Mechanics.

N64-11595 The College of Aeronautics, Cranfield (Gt. Brit.)
EXPERIMENTS ON A JET-FLAP DELTA WING IN GROUND EFFECT
A. J. Alexander [1963] 20 p refs
(COA-AERO-164)

Tests have been made on a 70° cropped delta wing with trailing-edge slot blowing both with and without a fixed ground board. Jet deflections of 0° and 30° were used. The incidence range was $-1 < \alpha < 20°$, and height/root chord ratios varied between 0.12 and 0.22, the lowest height corresponding to touchdown at 15° incidence. Lift increased steadily as the ground was approached, due to the "balking" of the airflow between the model and the ground. The effect of the trailing-edge jet was small, except when the jet impinged on the ground plate, causing some reduction in lift at the highest incidence. Drag was increased at a given incidence in ground effect, the increase pressure lift. In general, both the aerodynamic center and center of pressure moved rearward as the ground was approached, but moved forward very quickly when the jet impinged on the ground board. Author

N64-11883* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
FLIGHT MECHANICS ASPECTS
Walter C. Williams *In* Advisory Group for Aeron. Res. and Develop. Proc. of the 12th AGARD Gen. Assembly Sep. 1962 p 111–115 (See N64-11877 03-01)

The accomplishments of the AGARD Flight Mechanics Panel over the past ten years are briefly reviewed, and the application of the principles evolved in airplane testing to the design of spacecraft tests is discussed. The Panel has prepared a standard flight-test manual covering performance, stability and control, instruments, and instrument systems; another on V/STOL handling requirements is in the process of publication. The evaluation of the lightweight fighter aircraft by engineers and pilots of member countries is cited as an example of continuous cooperation in the Panel's activities. In the design of tests for spacecraft, few actual aircraft testing techniques are applicable, but the redundant systems and step-by-step approaches remain valid. Moreover, more sophisticated spacecraft are being designed with lifting bodies for which the results of airplane flight research may be useful. The value of the Panel as a medium whereby experiences of member nations can be shared is stressed. M.P.G.

N64-11907 Advisory Group for Aeronautical Research and Development, Paris (France)
AERODYNAMIC ASPECTS OF BOUNDARY LAYER CONTROL FOR HIGH LIFT AT LOW SPEEDS
J. Williams and S. F. J. Butler (Roy. Aircraft Estab., Farnborough) Jan. 1963 76 p refs
(AGARD-414)

The usefulness of boundary-layer control (B.L.C.) at the knee of a trailing-edge flap, over the wing nose close to the leading edge, or at the knee of a leading-edge flap, is noted. Various methods of providing B.L.C. are outlined, comprising slot blowing, slot suction, area suction, inclined airjets, and specially-designed aerofoil shapes. The aerodynamic aspects of slot blowing over trailing-edge flaps and the wing nose are examined in detail, and both slot suction and area suction are also considered. The associated practical design features required for good performance are discussed, and some flight-handling implications are mentioned. Author

N64-12115 Stanford U., Calif.
FURTHER VERIFICATION OF JET FLAP THRUST RECOVERY AND IDENTIFICATION OF ITS MECHANISM
Alton H. Quanbeck (Ph. D. Thesis) Jan. 1963 102 p refs
(Sponsored by Gen. Dyn. Corp.)
(SUDAER 144)

An experimental investigation was conducted to extend and clarify the initial verification of Stratford's jet flap thrust-recovery theorem and to identify the mechanism of thrust recovery. Models were tested in a two-dimensional airstream characterized by free upper- and lower-surface boundaries. The tests consisted of simultaneous determination of the forces and

distributions of external pressure which resulted from the systematic variation of flap deflection and jet blowing rate. Analysis of force test data demonstrated that the variation of jet efflux direction had little or no effect upon thrust recovery so long as flow detachment did not occur. Verification of the thrust-recovery theorem was thereby extended to include jet flapped wings characterized by oblique and streamwise jet efflux. C.L.W.

04 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc., and specific types of complete aircraft (e.g., Ground Effects Machines, Flexible Wings, STOL, and VTOL); flight tests; operating problems; safety devices; and stability and control. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 30 Space Vehicles.

N64-11550* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

FULL-SCALE WIND-TUNNEL TEST OF THE VZ-2 VTOL AIRPLANE WITH PARTICULAR REFERENCE TO THE WING STALL PHENOMENA

Robert G. Mitchell Washington, NASA, Dec. 1963 60 p refs (NASA TN D-2013) OTS: $1.50

A correlation was made at the trim level-flight condition which showed good agreement between the wind-tunnel force data, and corresponding flight data on lift and drag. The wind-tunnel force-test results, however, showed no apparent correlating factor with the flying-qualities problems associated with wing stall. Tuft tests did correlate with the acceptable or unsatisfactory flying characteristics for certain flight conditions. There were flight conditions, however, for which the flying characteristics associated with extensive stalling could not be explained by the tuft data. Author

N64-11627 Minneapolis-Honeywell Regulator Co. Minn. Military Products Group

ON THE ADDITIONAL ACCELERATION IN THE MOTION OF CELESTIAL BODIES

R. A. Saakyan [1963] 15 p refs Transl. into ENGLISH from Astron. Ah., v. 39, no. 5 Sep. Oct. 1962 p 931–937 (MH-Transl. 419)

It is shown that due to the curvilinear motion of the center of gravity of a binary system, additional acceleration appears in the equation of relative motion. It is expressed by

$$S = 2\left[\frac{\tilde{d}\bar{r}}{dt}\bar{w}\right] + \left[\bar{w}\left[\bar{r}\bar{w}\right]\right] + \left[\dot{r}\frac{d\bar{w}}{dt}\right].$$

where $\bar{w}$ is the angular velocity of motion of the center of gravity, $\frac{dr}{dt}$ is the velocity of relative motion in the rotating system, r is the distance between the components, and $[\,]$ the vector product.

Up to the present, several problems in astronomy have been solved without allowing for the above acceleration. These include problems on the relaxation of stellar systems, and relative motion in binary systems (the motion of planets relative to the sun, tidal phenomena on the earth, etc.). In more precise solutions it is necessary to take the above circumstance into account. Author

N64-11634 Canadian Armament Research and Development Establishment, Valcartier

AERODYNAMIC CHARACTERISTICS, PREFLIGHT CALCULATION, AND FLIGHT TEST RESULTS OF CARDE'S BLACK BRANT I — (01 TO 07) FIRINGS AT FORT CHURCHILL

H. K. Clark and J. R. Delisle Jun. 1963 293 p refs (CARDE-TM-695/63)

The flight test objectives of these vehicles were as follows: (1) to obtain propellant ballistic data by means of telemetered information over a propellant temperature range of −13° F to 100° F; (2) to obtain trajectory and dispersion data; and (3) to measure the skin temperature and the dynamic properties of the rocket. The flight results of these firings indicated that: (1) six of the test vehicles performed satisfactorily over the propellant temperature range of −13° F to 100° F; (2) the Black Brant I vehicle had the ability of lifting a 140-pound payload to 100 miles altitude for an 80° launch angle; and (3) the measured spin rates and lateral accelerations were less than 1 rps and 2 g's, respectively. Author

N64-11654 Federal Aviation Agency, Atlantic City, N.J. Systems Research and Development Service

EVALUATION OF A FOUR SECTOR AIRCRAFT EXTERIOR LIGHTING SYSTEM Final Report

Paul M. Rich and William A. Hiering Nov. 1963 53 p refs

The major difference between three-sector and four-sector systems is that the three-sector system does not distinguish right from left in the rearward sectors. The forward sectors of both systems are identical; therefore, the flight test was designed to present collision threat and nonthreat situations viewed from the rear sectors only. Both systems were viewed by ten subject pilots in a series of fifty random-flight problems presenting collision threat and nonthreat situations. Analysis of the flight test results indicated that the proposed four-sector lighting system was 33 percent more effective than the three-sector system in providing collision threat information, and this difference was reliable at the .01 level of significance. It was concluded that the four-sector system offers an improvement over the three sector in providing collision avoidance information. Author

N64-11770 Army Missile Command, Huntsville, Ala.

TRANSPORTATION-VIBRATION TEST OF PERSHING MISSILE SYSTEM TACTICAL SHIPPING AND STORAGE CONTAINERS, PHASE III Final Report

R. G. Eyestone 7 Nov. 1963 31 p (RT-TR-63-9; AD-423631)

This test subjected modified, tactical first-stage and unmodified, tactical second-stage containers for the PERSHING missile system, and their dummy loads, to a road test designed to duplicate the vibration spectrum expected during truck transportation. Author

N64-11806 Advisory Group for Aeronautical Research and Development, Paris

THE PROBLEMS OF EXACT CALCULATION OF TAKE-OFF AND LANDING CHARACTERISTICS OF CONVENTIONAL TRANSPORT AIRCRAFT

E. Overesch (Weser Flugzeugbau, G.m.b.H.) Jan. 1963 Presented at the Aircraft Take-Off and Landing Specialists' Meeting, sponsored by the AGARD Flight Mech. Panel, held in Paris, 15–18 Jan. 1963 (AGARD-417)

The ground roll, transition, and steady-climb phases of conventional takeoff calculations often ignore certain factors which are of relatively little importance for small aircraft and long

takeoff runs but which may be significantly important for large aircraft and short takeoff runs. These factors, and the effect of taking account of them in the takeoff and landing calculations, are discussed in this report. Author

N64-11885* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ADAPTATION OF AIRCRAFT TESTING PRINCIPLES TO MANNED SPACE FLIGHT
Walter C. Williams *In* Advisory Group for Aeron. Res. and Develop. Proc. of the 12th AGARD Gen. Assembly Sep. 1962 p 125–154 (See N64-11877 03-01)

The interrelationships between mission objectives, vehicle design, and hardware development for any given mission are discussed in relation to test objectives and test scheduling. The testing principles previously developed for aircraft provide guidelines concerning the time at which a standard configuration must be specified, the choice of engineering tradeoffs, and the definition of significant hardware control areas. The test sequences and objectives of the Mercury Project are tabulated as an example of the development of an operational manned spaceflight system. The objectives of the Gemini and Apollo missions require systems of increased complexity and dependability which will be best developed by progressive mission experience. M.P.G.

N64-11950 Advisory Group for Aeronautical Research and Development, Paris (France)
THE PROVISION OF ADEQUATE LATERAL CONTROL POWER FOR LANDING APPROACH CONDITIONS
G. A. Patterson and W. Spangenberg Jan. 1963 17 p refs
(AGARD-419)

An investigation at the Naval Air Test Center has attempted to correlate the measured rolling performance of both large and small airplanes in the landing approach condition, with pilot opinion regarding adequacy of lateral control power to pick up a wing, or to maintain the desired flight path in the presence of turbulence or crosswinds. This report describes the NATC investigation and tentative flight test results obtained, in relation to current flying qualities specification requirements. Bank angle changes at the end of one second of 20° for carrier-based airplanes, and 8° for land-based airplanes, are suggested as criteria for lateral control power in the landing approach condition. Author

N64-11991 Advisory Group for Aeronautical Research and Development, Paris (France)
FLIGHT MEASUREMENTS OF THE INFLUENCE OF SPEED STABILITY ON THE LANDING APPROACH
K. J. Staples Jan. 1963 31 p refs
(AGARD-420)

A small delta aircraft has been used to study the effects of speed instability on the pilot workload, and accuracy in the approach task. Speed instability was produced by the use of a reversed autothrottle which varied thrust with airspeed and/or incidence. Glide path control was by radio talkdown, based on information from either a tracking theodolite or normal airfield radar. It is concluded that mean square throttle movement is a useful guide to the effect of speed stability on the difficulty of the approach, and corresponds with pilot ratings. Also, there are indications that throttle movements are unaffected by the type of talkdown control, whereas elevator, speed, and glide path measurements are altered appreciably. Author

N64-12040 Stevens Inst. of Tech., Hoboken, N.J. Davidson Lab.
THE EFFECT OF LONGITUDINAL DECELERATION ON THE LOADS AND MOTIONS OF A SEAPLANE LANDING IN WAVES
Gerard Fridsma Sep. 1963 42 p refs
(Contract NOa(s) 59-6081-c)
(R-924; AD-422872)

A dynamic seaplane model was landed in six wave sizes of various heights and lengths, with three values of reverse thrust, covering a range of longitudinal deceleration of from 0.2 to 0.7 g's. The maximum accelerations at the CG and bow, together with the maximum heaves and trims, were recorded for each landing and analyzed statistically. It was found that increased longitudinal deceleration resulted in a reduction of the loads occurring later in the landing runout, while the loads resulting from the first and second contact were unaffected. The effect of reverse thrust on the magnitude of the loads and motion excursions that would be exceeded only once in a hundred landings was not great, due to the good landing characteristics of the high deadrise seaplane model tested. However, a definite reduction in the magnitude of the bow loads and heaving motions was found with increased deceleration. Author

N64-12083 Air Force Systems Command, Wright-Patterson AFB, Ohio
AVIATION REVIEW (SELECTED ARTICLES)
6 May 1963 9 p Transl. into ENGLISH of 3 articles from Letecky Obzor Prague, v. 6, no. 8, 1962 p 265, 268, and 269
(FTD-TT-63-219/1; AD-409271) OTS: $1.10

Three subjects discussed are: (1) modification of the TU-104A jet aircraft to hold more passengers; (2) the facilities and services of a new airfield in Moscow; and (3) an attempt to build a flying apparatus that would duplicate the flying characteristics of a flying saucer. J.E.T.

N64-12084 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
CZECH AIRCRAFT L-29
21 May 1963 5 p Transl. into ENGLISH from Skrzydlata Polska, no. 5, 3 Feb. 1963 p 10–11
(FTD-TT-63-299/1; AD-413573)

The L-29 is a single turbojet, all metal, twin-seat training aircraft. A technical description of the L-29's construction, engine, equipment, and flight characteristics and capabilities is presented. J.E.T.

N64-12175 Lockheed-California Co., Burbank
FULL SCALE WIND TUNNEL TESTS OF THE LOCKHEED XH-51A RIGID ROTOR HELICOPTER CONFIGURATION
R. H. Cotton and T. H. Ogiesby 31 Aug. 1963 335 p refs
(Contract NOw-62-0665-d)
(LR-16366; AD-425020)

Tests were conducted in the 40-ft X 80-ft Wind Tunnel at Ames Aeronautical Laboratory on a full-scale model of the Lockheed XH-51A rigid rotor system. The rotor was actual flight hardware. Rotor system stability was demonstrated to 160 knots, and rotor loads that were essentially as predicted were measured. A blade feathering bearing hardware deficiency was found and corrected. Author

N64-12184 Aerospace Corp., El Segundo, Calif. Engineering Div.
STANDARD LAUNCH VEHICLE I (SLV-I) SYSTEM – DESCRIPTION AND OPERATION SUMMARY

R. H. Mc Culloch Sep. 1963 177 p refs
(Contract AF 04(695)-269)
(TDR-269(4303)-2; SSD-TDR-63-288; AD-423703)

An SLV-I system description and flight operation summary is presented for ready reference to the SLV-I program and to facilitate reliability evaluations. The system description is brief and primarily concerned with defining configuration differences. The flight operation summaries are extracts of system hardware performance and anomalies as reported in contractor flight evaluation reports. Author

N64-12386 Chance Vought Corp., Dallas, Tex. Aeronautics and Missiles Div.
MODEL F-8E AIRPLANES FLIGHT TEST SUMMARY REPORT FOR THE PERIOD ENDING 30 NOVEMBER 1963
R. R. Reed, Jr. 12 Dec. 1963 7 p
(FT(F-8)-306)

Flight evaluation tests of a model F-8E aircraft and a Royal Norwegian Air Force Crusader aircraft (model YTF-8A) are discussed. Push-pull and wind-up turn maneuvers, with cruise droop extended and retracted, were recorded at 0.80 Mach number and 40,000 feet for the model F-8E aircraft. The range of load factors from −1.0 g to heavy buffet was covered. P.V.E.

05 ASTRONOMY AND ASTROPHYSICS

Includes celestial mechanics; and radioastronomy. *For related information see*: 12 Geophysics, and 29 Space Sciences.

N64-11454 Manchester U., Macclesfield (Gt. Brit.)
LUNAR LUMINESCENCE INVESTIGATIONS Technical Note No. 2
J. F. Grainger Jun. 1963 28 p refs
(Contract AF 61(052)-378)
(AFCRL-63-743; AD-422445)

Observations made during 1961 and 1962 (with instruments specially developed for the purpose) are described. Luminescence is confirmed at wavelength 3970 A for six lunar areas, while it was found to be zero in two others. The luminescence measured is then confronted with the known lunar environment and, by energy considerations, it is shown that the most likely stimulant is solar ultraviolet radiation. Author

N64-11567 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
ON THE CLASSICAL THEORY OF PERTURBATIONS IN THE STABILITY PROBLEMS OF PLANETARY SYSTEMS
V. I. Arnol'd [1963] 12 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Mat. v. 145, no. 3, 1962 p 487–490
(MH-Transl. 414)

The perturbation theory permits the prediction of the motion of the planets many years in advance and with all necessary accuracy. However, the qualitative questions on the behavior of the system during an infinitely large interval of time, for example, the question on the stability, could not be solved by the perturbation theory. Author

N64-11578 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
ON THE FORMATION OF INTERPLANETARY DUST CONDENSATION AROUND THE EARTH
E. L. Ruskol Aug. 1963 13 p refs Transl. from Russian into ENGLISH of an article from Artificial Earth Satellites, no. 12, 1962 p 145–150
(MH-Transl. 462)

Two mechanisms for the condensation of dust particles around the earth are proposed, namely: (1) that the capture of the interplanetary dust particles by the earth is associated with their nonelastic collisions among themselves in the neighborhood of the earth; and (2) that the upper atmosphere causes deceleration of the dust-particle velocities. Author

N64-11628 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
ON THE QUESTION OF THE STABILITY OF FILAMENTS IN GAS-DUST NEBULAE
T. V. Papova [1963] 20 p refs Transl. into ENGLISH, from Astron. Zh., v. 39, no. 5, Sep.–Oct. 1962 p 868–878
(MH-Transl. 421)

The problem of the gravitational instability of an infinite compressible cylinder with a free boundary relative to arbitrary surface type disturbances is considered. Equations of hydrodynamics in linear approximation are used for the solution. It is found that the stability of the cylinder is determined by the compression parameter $a = \sqrt{4\pi G\rho_0}R_0/v_t$. Instability can set in only for values of a within the limits $0<a<a^*$, where $a^* = 1.55265$. For each value of a within these limits there exists a maximal unstable harmonic. The values $a_0 = 0.7276$ and $z_0 = 0.702$ are found at which there is maximal instability of the surface type. The results obtained are applied for an estimate of the stability of filaments of gas–dust nebulae. Author

N64-11884 Air Force Flight Test Center, Edwards AFB, Calif.
PILOT EXPERIENCE WITH THE X-15 AIRPLANE
Robert A. Rushworth *In* Advisory Group for Aeron. Res. and Develop. Proc. of the 12th AGARD Gen. Assembly Sep. 1962 p 117–123 (See N64-11877 03-01)

A discussion of the test pilot as a member of the engineering profession is presented. The advantages of piloted, redundant systems over unmanned, nonredundant systems have been amply demonstrated by the X-15 test records. The usefulness of the pilot's postflight account in evaluating any discrepancy from the desired flight profile was also demonstrated. Anxiety (as differentiated from fear or preoccupation) on the part of the pilot flying a test mission is discussed and shown to have the effect of limiting the pilot's scope of action to those essential tasks which must be done well if the mission is to succeed. In many cases, anxiety also results in an increase in efficiency and the accomplishment of secondary tasks as well. The minimum prerequisites for man in space are considered to be education, experience, motivation, and proficiency, but the optimum proficiency that will alleviate anxiety can never be attained with any number of simulated events. The importance of the contribution of pilot's engineering opinion to the development of new techniques and presentations is stressed. M.P.G.

N64-12023 Aerospace Information Div., Library of Congress, Washington, D.C.
SOME NEW DATA ON THE STRUCTURE OF CHONDRITES [NEKOTORYYE NOVYYE DANNYYE O STROYENII KHONDRITOV]

L. G. Kvasha 12 Dec. 1963 20 p refs Transl. into ENGLISH from Meteoritika no. 20, 1961 p 124–136
(AID T 63-122) OTS: $1.60 ph, $0.80 mf

The results of research related to two problems in the study of the structure of chondrites are presented. In the first problem, the structure of particles of metallic iron and, to some extent, of troilite was investigated. The structure of metallic particles and of some sulfides in chondrites, which differ in structure and in metallic-iron content, was compared. The second problem considered is the relation between the content of metallic iron and the iron content of silicates in chondrites, and the possibility of using that relationship for systematic investigatory purposes. A graph is included that shows: (1) the relationship between the content of nickel-iron w/o and the magnitude of the average index of refraction of silicates (olivine and rhombic pyroxene) in common chondrites; and (2) the content w/o of troilite in the same chondrites. R.T.K.

N64-12028* Smithsonian Astrophysical Observatory, Cambridge, Mass.
OPTICAL RADAR RESULTS AND METEORIC FRAGMENTATION
G. Colombo (Padua U.) and G. Fiocco (M.I.T.) 15 Oct. 1963 27 p refs
(NASA CR-55057; SAO Special Rept. 139) OTS: $2.60 ph, $1.01 mf

Recent optical radar observations of echoes from the upper atmosphere were reported. The results of numerous successive nights of observations indicate weak, sporadic echoes at altitudes between 110 and 140 km. These results are summarized and presented in graphic form. The echoes are tentatively interpreted according to a model of meteoric fragmentation which shows that by progressive fragmentation in its flight through the atmosphere, a meteoroid should show an enhancement of cross section responsible for these echoes. The atmosphere would be working as a "filter," and the average size distribution of micrometeorites would vary with the height. On the basis of the radar observations and of the model of fragmentation, an attempt can be made to estimate the influx on earth of meteoric material that is undergoing fragmentation and is of a size suitable for observation. R.T.K.

N64-12281 American Meteorological Society, Boston, Mass.
THE SECONDARY SCATTERING OF LIGHT DURING TOTAL SOLAR ECLIPSE [LA DIFFUSIONE SECONDARIA DELLA LUCE DURANTE LE ECLISSI TOTALI DI SOLE]
R. Cialdea Nov. 1962 24 p refs Transl. into ENGLISH of an article from Ann. Geofis (Rome), v. 10, 1957 p 61–70
(Contract AF 19(604)-6113)
(AD-410175)

The distribution of the state of polarization in the sky, during a total solar eclipse, was studied in order to verify the validity of Hurion's hypothesis. The results of the investigation indicate that both experimentally and theoretically Hurion's hypothesis is not sufficient to describe this distribution.
R.T.K.

N64-12285 Brandeis U., Waltham, Mass.
THE EFFECT OF THE SURFACE LAYER OF A STAR UPON BLACK BODY RADIATION EMERGING FROM THE INTERIOR Scientific Report No. 1
Murray Turoff 1 Mar. 1963 26 p refs
(Contract AF-19(604)7283)
(AFCRL-63-419; AD-423901)

A form of Burmann's Theorem is used to obtain an expansion of the radiation intensity at the surface of a star as on expansion explicitly dependent on the blackbody function, absorption coefficient, density, and the first few derivatives of these functions with respect to depth. Conditions for the convergence of the series are established. The expansion is modified for the case of organized outward motion of the surface layer, and the effect of this motion on an absorption line is examined. Conditions for the shift of the line "center" to lower or higher frequencies due to the effects of the organized motion and the decay of temperature in the surface layer are also examined.
Author

06 AUXILIARY SYSTEMS

Includes fuel cells and solar cells; gas turbines; hydraulic, pneumatic and electrical control systems and actuators; and inverters. *For primary propulsion systems see*: 27 Propulsion. *For related information see*: 08 Communications; 09 Electronics; 10 Facilities, Research and Support; 15 Instrumentation and Photography; and 22 Navigation and Guidance.

N64-11453 Library of Congress, Washington, D.C. Aerospace Information Div.
DIRECT ENERGY CONVERSION IN THE USSR: SOLAR CELL RESEARCH Comprehensive Report
6 Feb. 1963 63 p refs
(AID Rept. P-63-20; AD-297389) OTS: $6.60 ph, $2.09 mf

The majority of the photovoltaic cell experts in the U.S.S.R. seems to be much more interested in working out general formulas to explain experimental results rather than in trying to solve experimentally any practical problems. Aided by rigorous mathematical training, the scientists of the U.S.S.R. may well prove able to achieve their aim of replacing the present inadequate theoretical framework underlying the photovoltaic phenomena with one in better agreement with observable data. While the task of reworking the photovoltaic effect theory may take time, there are reasons to expect that the heavy reliance of Soviet researchers on theoretical considerations is already paying off by allowing them to avoid certain costly mistakes; for example, they correctly chose for their sputniks the p-type-base silicon cell instead of the easier to produce but much less radiation-resistant n-type used in the solar cells of the U.S. satellites. I.v.L.

N64-11629 Cleveland Pneumatic Industries, Inc., Ohio
DESIGN STUDY OF FLUID ENGINE POWER SYSTEMS
C. H. Baker, T. A. Hunter, R. S. Pauliukonis, and A. V. Pradhan Oak Ridge, Tenn., AEC Div. of Tech. Inform., 12 Apr. 1963 286 p refs
(Contract AT(30-1)-3022)
(NYO-10398) OTS: $3.50

This report presents information on an engine which uses a supercritical working fluid as the secondary portion of nuclear-powered electric-generating systems. Detailed analysis of the PM-2A secondary system showed significant cost, weight, and size reductions to be possible by conversion to the supercritical engine. Similar analysis of the ML-1 secondary system showed a significant efficiency improvement, but this is offset by increased cost, a 10% increase in weight, and essentially the same volume. Thermodynamic operating principles are given, and details of operation of the supercritical fluid engine are

described. Technical results of investigations into the problems of heat transfer at high pressures and background information on supercritical thermodynamics are presented. Preliminary design layouts of two sizes of engines are included by reference, and the basic parameters for a wide range of heat exchangers and engines are discussed. Author

N64-11631 Sandia Corp., Albuquerque, N. Mex.
DC POWER SUPPLY FOR FERROELECTRIC LOOP GENERATION
J. L. Wentz and C. W. Boots Nov. 1963 14 p refs
(SC-DR-260-63) OTS: $0.50

A voltage source is described which is capable of producing ±10 kv dc at 0.01 ma for tracing hysteresis loops of ferroelectric ceramic materials. The amplitude–time relation is produced by manual control. The salient features of the instrument are simplicity of construction, ease of operation, and reliability of performance. The device is also suitable as an ordinary power supply where a reversible polarity is desired. Author

N64-11741* Lear Siegler, Inc., Cleveland, Ohio Power Equipment Div.
BRUSHLESS ROTATING ELECTRICAL GENERATORS FOR SPACE AUXILIARY POWER SYSTEMS First Quarterly Report, 31 Oct. 1963
J. N. Ellis and F. A. Collins [1963] 155 p
(NASA Contract NAS3-2783)
(NASA CR-52915) OTS: $11.50 ph, $4.85 mf

Design manuals are presented for salient-pole wound-rotor generators and nonsalient-pole wound-rotor generators. A computer program and computer coding sheets are presented for salient-pole generators. The program is Bell for a 1620 computer. Author

N64-11800* Thompson Ramo Wooldridge, Inc., Cleveland, Ohio Tapco Div.
SUNFLOWER POWER CONVERSION SYSTEM 14th Quarterly Report, Jun.-Aug. 1963
Jay W. Picking, Jr. [1963] 27 p
(NASA CR-52962; ER-5546) OTS: $2.60 ph, $1.01 mf

Progress is reported in the following areas: (1) test-rig design and fabrication; (2) solar collector—testing included deployment and vibration testing with corresponding optical inspection for detection of collector damage; (3) turboalternator endurance testing; (4) lithium hydride containment—hydrogen permeability measurements are discussed; and (5) materials—the workhorse forced-circulation mercury corrosion loop was operated, and tests were conducted on the hydrogen-swallowing capabilities of the Sunflower centrifugal pump; hydrogen removal tests were conducted using various removal techniques. R.T.K.

N64-11809* Electro-Optical Systems, Inc., Pasadena, Calif.
HYDROGEN-OXYGEN ELECTROLYTIC REGENERATIVE FUEL CELLS
John J. Rowlette 18 Oct. 1963 49 p
(NASA Contract NAS3-2781)
(NASA CR-55059; EOS 4110-QL-1) OTS: $4.60 ph, $1.67 mf

Progress reported includes the following: (1) A system analysis of fuel cells was made by relating the cell-component weights to the fuel-cell electrode area, and then relating the latter to the pertinent operating parameters of the system. After this part of the analysis was completed, the weight relationships were programed into an IBM computer, and all parameters pertinent to the problem were varied systematically. For a given orbit and discharge power, the optimum current density for minimum system weight can be determined. From this current density, the number and size of the cells can be calculated. (2) A series of gas-diffusion studies were performed in order to set limits on the amount of water which can be electrolyzed from the electrolyte bed. (3) The design for the 75-watt prototype fuel cell is in its final stages of completion. (4) A constant current power supply to be used in conjunction with a cycler is presently being designed. The cycler will be capable of simulating any orbit up to a charging time of three hours. I.v.L

N64-11819* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
DEVELOPMENT OF A HYDROGEN-OXYGEN INTERNAL COMBUSTION ENGINE AUXILIARY ELECTRIC POWER SUPPLY SYSTEM Phase Report
N. E. Morgan (Vickers, Inc.) 30 Sep. 1963 437 p refs
(NASA Contract NAS3-2550)
(NASA CR-55060; FR-91565-430-1) OTS: $22.50 ph, $13.31 mf

The studies included: (1) evaluating the effect of propellant supply conditions on system configuration and performance; (2) evaluating adaptability of the system to various space missions; (3) preliminary design studies of an internal combustion prime mover, propellant supply components, power controls, electrical generator and voltage regulator, starting system, and other system components; (4) materials selection; and (5) reliability studies. Components, which were designed, constructed, and tested in prototype form, included an internal combustion engine operating on hydrogen and oxygen (nonstoichiometric), a cryogenic hydrogen gas compressor, and a regenerative heat exchanger. The results of the analysis and design studies, and the preliminary design of a flight-type auxiliary power system, are presented. The component test results are presented and discussed. Author

N64-11915 Joint Publications Research Service, Washington, D.C.
THE USE OF AUTOMATIC CONTROL SYSTEMS OF VARIABLE STRUCTURE FOR CONTROLLING OBJECTS WHOSE PARAMETERS VARY WITHIN A WIDE RANGE
S. V. Yemel'yanov and V. I. Utkin 18 Dec. 1963 7 p refs
Transl. into ENGLISH of a report from Dokl. Akad. Nauk SSSR (Moscow), v. 152, no. 2, 1963 p 299–301
(JPRS-22343; OTS-64-21053) OTS: $0.50

A system of differential equations are given that state that in a region G of an n-dimensional phase space $x_1,...x_n$ there exists a certain region $U \subset S$ (S is a hyperplane which is specified by the equation $\sum_{i=1}^{n} c_i x_i = 0$), in which the motion is determined only by the coefficients c_i. However, it follows from the second of the differential equations given that the boundaries of the region U depend on c_1 and also on the parameters of the controlled object. It may happen that the representing point moving in the region U may reach the boundary of this region and depart from the hyperplane S. In that case, the further motion of the system will be determined not only by the coefficients c_1, but also by the variable parameters of the object. In order to solve the differential equations after the representing point has reached S, it is necessary that the region U for the values of these coefficients must coincide with the hyperplane S ($U \supset S$). An example is included which demonstrates the usefulness of the system of equations for describing an automatic control system of variable structure that is used for controlling objects whose parameters may change. R.T.K.

N64-11919 Joint Publications Research Service, Washington, D.C.
AUTOMATIC MEASUREMENT OF COORDINATES
A. A. Korostelev 19 Dec. 1963 90 p refs Transl into ENGLISH of the book "Avtomaticheskoye Izmeteniye Koordinat" (Moscow), Mil. Publ. House, USSR Min. of Defense 1961 p 1–103
(JPRS-22384; OTS-64-21074) OTS: $2.25

Methods for the automatic measurement of coordinates at radar stations, on the basis of both tracking data and discrete data obtained by search radar when it locates the target, are presented. The principles whereby the automatic tracking system of a radar station feeds target data into an analog computer, and the subsequent conversion into numerical data for input into a digital computer are reviewed. M.P.G.

N64-11999 Atomics International, Canoga Park, Calif.
FLOW CONTROLLER EVALUATION FOR SODIUM SERVICE
R. A. Winborne 30 Nov. 1963 38 p refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-7534) OTS: $0.75

Tests were conducted to evaluate the performance of a 10-in. flow controller in sodium at temperatures up to 1200° F. Torque tube reliability was determined by extensive mechanical cycling tests and further checking with a helium mass-spectrometer leak detector. Flow control performance and valve vibration characteristics were tested and evaluated, and flow rate limits were established. The valve assembly was subjected to a thermal shock test program, simulated to represent the most severe conditions likely to be encountered during a minimum 10-year lifetime. Author

N64-12025 General Electric Co., Schenectady, N.Y. Advanced Tech. Labs.
RESEARCH STUDY ON THE USE OF AUXILIARY ELECTRODES IN SEALED SILVER-CADMIUM CELLS Final Project Report, Jul. 1962–Jun. 1963
[1963] 45 p
(NASA Contract NAS5-2817)
(NASA CR-55014) OTS: $4.60 ph, $1.55 mf

This report describes the work done on the use of auxiliary electrodes to increase the rate of recombination of the oxygen generated in sealed silver-cadmium cells during charging. In the study, small test cells incorporating an auxiliary electrode were cycled at various rates, and were continuously charged at various rates, with limited tests at −10° C and 40° C being made. The results show that the addition of an auxiliary electrode to standard silver-cadmium cells is feasible, and that such cells give essentially zero pressure rise in cyclic and continuous charging. The use of auxiliary electrodes requires a small increase in the weight of the cell, and a somewhat greater increase in cell volume; the amount of the increases depends principally upon the area of auxiliary electrode needed. This area in turn is proportional to the maximum charging current to be used. The use of the auxiliary electrode does not change the electrical characteristics of the silver-cadmium cells, nor does it interfere in the use of the cells in batteries. Author

N64-12031* Globe-Union, Inc., Milwaukee, Wisc.
THE DEVELOPMENT OF HIGH ENERGY DENSITY PRIMARY BATTERIES, 200 WATT HOURS PER POUND OF TOTAL BATTERY WEIGHT MINIMUM 1st Quarterly Report, 1 Aug.–31 Oct. 1963
Warren L. Towle [1963] 55 p refs
(NASA Contract NAS3-2790)
(NASA CR-55055) OTS: $5.60 ph, $1.85 mf

Emphasis was on studying the nature of nonaqueous solvents, solvent–solute combinations, nonaqueous conductivity, nonaqueous chemistry, thermodynamic and electrochemical properties of systems, experimental methods of purification of materials, and experimental methods for conductivity and electrochemical kinetics studies. Thermodynamic calculations have been completed for electrode couples which could theoretically produce energy densities in excess of 200 watt-hours per pound; the results are presented in tabular form. Based on the presented theoretical considerations, systems chosen for preliminary studies are: (1) magnesium and aluminum anodes; and (2) benzonitrile, dimethyl formamide, diphenyl ether, and propylene carbonate solvents. P.V.E.

N64-12058 Union Carbide Corp., Parma, Ohio
THIN FUEL CELL ELECTRODES Quarterly Report No. 1, 1 June–1 Sep. 1963
K. V. Kordesch Fort Monmouth, N.J. Army Electron. Res. and Develop. Lab. 1963 167 p refs
(Contract DA-36-039-AMC-02314(E))
(AD-425031)

Data have been collected which show that the features of metal and carbon electrodes can be combined in so-called "fixed-zone" electrodes, manufactured by layering a porous-nickel backing with an active carbon material which contains the catalysts. The available sintered-nickel plaques usable for electrode backing were physically characterized. Carbon materials suitable as electrode base material were screened in respect to their properties, and preliminarily evaluated electrochemically. Author

N64-12065 Royal Aircraft Establishment, Farnborough (Gt. Brit.)
OPERATION AT DIFFERENT VOLTAGES OF AN AIRCRAFT OSCILLOGRAPH EQUIPPED WITH AN ULTRA-VIOLET RADIATION SOURCE (MEHRSPANNUNGSBETRIEB EINES MIT UV-STRAHLUNGSQUELLE AUSGESTATTETEN LUFTFAHRTOSZILLOGRAPHEN)
Reinhold Roggan London, Min. of Aviation, Jul. 1963 16 p Transl. into ENGLISH from Z. Instrumentenk. (Brunswick W. Ger.), v. 69, no. 9, 1961 p 244–249
(RAE-TRANS-1040)

A technique is developed, based on the physical properties of an arc in a high-pressure discharge lamp, for an aircraft oscillograph working at different voltages, using an ultraviolet source. The principle of this technique is discussed, the advantages gained are indicated, and practical experience is described. Author

N64-12090 Princeton U., N.J. Plasma Physics Lab.
A FAST ACTING ULTRA-HIGH VACUUM GAS INLET VALVE AND ITS USE IN THE PRODUCTION OF SPECIAL NON-STATIONARY PRESSURE DISTRIBUTIONS IN THE C STELLARATOR
G. Lewin and D. Mullaney Oct. 1963 16 p refs
(Contract AT(30-1)-1238)
(MATT-225)

The C stellarator vacuum system is equivalent to a long tube with a gas injection valve at one end, and a larger volume with pumps at the other end. The gas is admitted in a short burst of 10 to 50 msec duration, and the machine is energized before an excessive amount of gas reaches the volume at the end of the tube. The paper describes the design of the valve and the theoretical analysis of the transient pressure distribution

before and after the stellarator is energized. This is an example of the calculation of the transient behavior of a vacuum system with distributed volume. Author

N64-12147 Joint Publications Research Service, Washington, D.C.
NEW DEVELOPMENTS IN PNEUMATIC-HYDRAULIC AUTOMATION
M. A. Ayzerman, ed. 2 Jan. 1964 207 p refs Transl. into ENGLISH of the anthology "Novoye v pnevmo-gidravlicheskoy avtomatike", Moscow, Acad. of Sci. USSR Publ. House, 22 Oct. 1962 p1-160
(JPRS-22570; OTS-64-21187) OTS: $3.50

The pneumoautomatic systems and elements discussed include the following: a system of pneumatic analog computers working in the low range of pressures; pneumatic binary elements as means of automation; pneumatic receiving and actuating devices for automatic machines; automatic control system for multiplicity of circulation of a finely dispersed catalyzer; control systems and pneumatic automation devices for blast and open-hearth furnaces; the use of pneumatic relays of discrete operation in gas analysis circuits; electropneumatic current and pneumatic converters; diaphragmless pneumatic converter of force into pressure; and the effect of reflected wave conditions on the speed of signal transmission over short communications channels in a pneumatic automation system. Hydraulic systems and devices are also discussed. R.T.K.

N64-12152* Borden Chemical Co., Philadelphia, Pa. Central Research Lab.
RESEARCH AND DEVELOPMENT OF SEPARATORS FOR SILVER OXIDE-ZINC AND SILVER OXIDE-CADMIUM CELLS FOR SPACECRAFT APPLICATION First Quarterly Report, 27 Jun. -27 Sep. 1963
H. E. Hoyt and H. L. Pfluger 15 Nov. 1963 26 p refs
(NASA Contract NAS5-3467)
(NASA CR-52475) OTS: $2.60 ph, $0.98 mf

Films of diverse polymer types were prepared and screened as candidates for separators, using bench tests developed for this purpose. On the basis of the tests, films of hydroxyethyl alcohol (HEPVA) and polyvinyl alcohol were submitted for tests in cells. Of the polymers screened to date only water-soluble or near water-soluble types have shown the order of conductivity of cellophane. Resistance to oxidation under simulated cell conditions (silver oxide in 30% KOH) was measured by visual observation and by flex tests. These showed marked deterioration of cellophane and excellent retention of flexibility by hydroxyethyl polyvinyl alcohol and polyvinyl alcohol. Methyl cellulose also resisted oxidation better than cellophane and may show sufficient promise to warrant trial in cells. Author

N64-12217 General Dynamics Corp., Groton, Conn.
A LABORATORY MODEL OF AN INTEGRATED WATER RECOVERY SYSTEM
J. B. Presti, H. C. Miner, R. Nickerson, and H. Wallman Wright-Patterson AFB, Ohio, Biomed. Lab., Oct. 1963 45 p refs
(Contract AF 33(657)-9310)
(AMRL-TDR-63-88; AD-424590)

The system was designed to convert to potable water 4.2 liters of urine plus 5.0 liters of wash water daily, under weightless conditions. It consists of a vapor compression distillation still, a postfiltration system, waste water and potable water storage tanks, a hot and cold water dispensing unit, and a graphic display control panel. This system produces potable water at the approximate design capacity under weightless conditions. Author

N64-12223 Army Missile Command, Huntsville, Ala.
TRANSPORTATION-VIBRATION TEST OF PERSHING MISSILE SYSTEM TACTICAL SHIPPING AND STORAGE CONTAINERS, PHASE IV Final Report
R. G. Eyestone 21 Oct. 1963 25 p
(RT-TR-63-10; AD-422783)

This test subjected a modified tactical first stage container for the PERSHING Missile System, with its dummy load, to a rough road test designed to duplicate the vibration spectrum specified during truck transportation. Author

N64-12224 Monsanto Research Corp., Dayton, Ohio
HIGH TEMPERATURE THERMOELECTRIC GENERATOR [Final] Technical Documentary Report [1 Oct. 1962-30 Sep. 1963]
C. M. Henderson, R. G. Ault, E. R. Beaver, H. B. Jankowsky and R. J. Janowiecki et al Wright-Patterson AFB, Ohio, AF Aero Propulsion Lab., Oct. 1963 156 p ref
(Contract AF 33(657)-7387)
(ASD-TDR-62-896, Pt. 2; AD-422854)

A nominal 5-watt laboratory model generator survived a 2556-hr sustained test in a vacuum of 10^{-5} to 10^{-6} mm Hg, with a hot junction temperature of 1200° C, and a cold junction temperature of 720° C, without degradation of power output. This generator exhibited a 2.75 w/lb (excluding electric heat source) performance. Segmented p- and n-type thermoelements, capable of operating between 1200° C and 500° C in a vacuum, were produced and evaluated for use in an advanced model generator. On the basis of the evaluations made on the segmented thermoelements, a nominal 50-watt advanced experimental model generator was designed, fabricated, and preliminarily tested. This generator weighed 3.88 lb, and produced 49.88 w when operated at a hot junction temperature of 1215° C, and cold junction temperature of 570° C, in a vacuum of 10^{-5} to 10^{-6} mm Hg. This performance equaled 12.8 w/lb (excluding heat source). The segmented high temperature p- and n-type thermoelements and highly emissive radiator coating were largely responsible for the improved w/lb performance attained. Author

N64-12308 Little (Arthur D.) Inc., Cambridge, Mass.
LOW TEMPERATURE OPERATION OF BATTERIES Quarterly Report No. 4, 15 Feb.-14 Sep. 1963
R. A. Horne [1963] 32 p ref
(Contract DA-36-039-SC-90706)
(AD-425168)

Calculations indicate that considerable current (about 1 amp) must be drawn from self-heating magnesium anode batteries in order to maintain a satisfactory working temperature without the benefit of insulation. Mathematical models of reasonable simplicity for describing the thermal properties of insulated battery systems give reliable results only in cases involving high efficiency insulation and/or single cells. These models fail in the case of batteries with practical insulations because the composite nature of the battery makes it exceedingly complex thermally and reduces its heat transfer properties to such an extent that the insulation ceases to be the sole heat-flow controlling factor. Author

N64-12380 Thompson Ramo Wooldridge, Inc., Cleveland, Ohio Solar Energy Systems Group
HIGH TEMPERATURE SOLAR THERMIONIC GENERATORS Quarterly Technical Progress Report, 1 Aug. 1963-Oct. 1963
A. E. Wallis 15 Nov. 1963 35 p refs
(Contract AF 33(657)-11169)
(TRW ER-5632; AD-423713)

Efforts during this quarter included the fabrication of four Series 300 thermionic converters. Design emitter temperature is 2000° K, and nominal output power to the load at 0.7 v is 21 w (7 w/cm^2). A total of 545 hours of continuous operation has been recorded for converter #302 with no decrease in performance. Converter #303 withstood a total of 430 cycles when an apparent internal emitter-to-collector short occurred. A failure analysis is currently being performed on this converter. Converter #305 has accumulated a total of 540 cycles. Performance data taken during cycle 509 showed a 17.5% decrease in power output. During the last 31 cycles the performance has held essentially constant at the reduced power output. Test of this converter is continuing. In addition, a demonstrator model test stand and auxiliary support vacuum system was fabricated and tested. This equipment was used during the acceptance test of converter #304, and met or exceeded all performance specifications. Author

N64-12390 Martin Corp., Baltimore, Md. Aerospace Div.
PRODUCTION OF STRONTIUM-TITANATE RADIOISOTOPE FUEL FOR SNAP 7B THERMOELECTRIC GENERATOR
Justin L. Bloom Washington, AEC Div. of Tech. Inform., 15 Apr. 1963 84 p refs
(Contract AT(30-1)-3062)
(MND-P-2977) OTS: $2.00

The conversion of 225,000 curies of strontium-90 to strontium titanate heat source pellets is described. Encapsulation of the fuel in 14 Hastelloy C containers and necessary leak testing, decontamination, and calorimetry procedures are also covered. Following completion of this first processing objective, loading of the SNAP 7B thermoelectric generator was accomplished. Author

N64-12403* Clevite Corp., Cleveland, Ohio Electronic Research Div.
STUDY OF THIN FILM LARGE AREA PHOTOVOLTAIC SOLAR ENERGY CONVERTER Tenth Monthly Status Report, Nov. 1-Nov. 30, 1963
W. J. Deshotels, F. Augustein, and J. Koenig 16 Dec. 1963 7 p
(NASA Contract NAS7-203)
(NASA CR-55090) OTS: $1.10 ph, $0.80 mf

Activities are reported in the following areas: (1) production of evaporated films—CdS films on glass and H-film substrates; (2) processing of photovoltaic cells—properties of CdS photovoltaic cells; (3) measurements—cell degradation studies, and development of mathematical models of ideal photovoltaic cells; and (4) alternate methods of producing films. R.T.K.

07 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy); chemical engineering; chemical properties of materials; and synthesis. *For related information see*: 18 Materials, Metallic; 19 Materials, Nonmetallic; and 26 Propellants and Combustion.

N64-11547 Oak Ridge National Lab., Tenn.
SEPARATIONS CHEMISTRY AND SEPARATIONS PROCESS RESEARCH Progress Report, Jan.-Jun. 1963
K. B. Brown 25 Oct. 1963 118 p refs
(Contract W-7405-eng-26)
(ORNL-3496) OTS: $2.50

Progress is reported in the following areas: (1) separations process development, including cesium recovery from ores; separation of alkali metal; acid recovery by amine extraction; final cycle plutonium recovery by amine extraction; extraction of lanthanides and transplutonium elements by dialkylphosphoric acids; extraction of nitric acid, lanthanides, and transplutonium elements by amines; extraction of lanthanides and transplutonium elements from carbonate solutions; summary of differences between the extractabilities of americium and cerium and europium; extraction of californium and einsteinium; extraction of americium(VI); and separation of transplutonium elements from iron; and (2) fundamental and descriptive chemistry of solvent extraction systems, including extraction of metals from chloride solutions with amines; N, N-dialkyl amides as extractants; distribution coefficients and separation factors as functions of diluent type—tributyl phosphate diluted by aromatics vs tributyl phosphate diluted by aliphatics; improved stability of Amsco 125-82; diluent effect on strontium extraction by Di(2-ethylhexyl)phosphoric acid; and the equilibrium between tri-*n*-octylamine and sulfuric acid in various diluents of low volatility. R.T.K.

N64-11556* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE TRANSPORT OF CHEMICALLY REACTING SPECIES IN THE CLASSICAL CAPILLARY
John T. Howe Washington, NASA, Dec. 1963 36 p refs
(NASA TN D-2063) OTS: $1.00

A simplified mathematical model of the transport of chemically reacting species in the microcirculatory system is presented. The differential equation describing mass transport in the capillary is derived. An order of magnitude analysis of the individual terms in the diffusion equation leads to some simplifications, and to the consideration of two principal regimes of interest which are defined in terms of a parameter that arises from the differential equations. The parameter suggests some "larger scaled" experimental models. A number of closed-form solutions of the differential equations are presented for special cases. The general case is discussed, and a means for studying it is suggested. Author

N64-11641 Brookhaven National Lab., Upton, N.Y.
A CHEMONUCLEAR PROGRAM FOR THE USAEC
B. Manowitz, C. Raseman, M. Steinberg, S. Stoller, J. Hogerton, and L. Geller (S. M. Stoller Associates) Jul. 1963 97 p refs
(Supported by AEC)
(BNL-804-(T-309)) OTS: $2.25

The current status of the applications of nuclear energy to the direct production of chemicals, through the utilization of the kinetic energy of recoiling fission fragments in chemonuclear reactors, is reviewed. Some interesting reactions have been observed, and rough measurements of reaction yields (molecules of product formed per 100 ev deposited in reactant) have been made under static conditions. However, the present understanding of fundamentals—the basic mechanism of fission fragment-induced chemical reactions, the phenomenon of energy transfer from fission fragments to reactant molecules (linear energy transfer and other effects), and the dependence of reaction rates on process variables—is sparse and, in many other areas, is nonexistent. In addition, some chemonuclear fuel forms have been studied in an exploratory way, work with in-pile loops has started, some chemonuclear reactor concepts have been hypothesized, and problems of product contamination have received some consideration. But a chemonuclear technology, as such, cannot be said to exist at the present time. I.v.L.

N64-11749 Stanford Research Inst., Menlo Park, Calif.
THE ROLE OF IONS IN THE RADIOLYSIS OF ORGANIC LIQUIDS Report, 1 Mar.-31 Aug. 1963
A. H. Samuel, M. A. Golub, and J. Danon Nov. 1963 55 p refs
(Contract AF 33(657)-8205)
(RTD-TDR-63-4133; AD-423856)

Irradiation to 3×10^{21} ev/g of solutions of stannic chloride ($SnCl_4$) in toluene at 195° K by 1-Mev electrons gave o- and m- and/or p-chlorotoluene yields (G, molecules/100 ev) which were unaffected by changes in temperature and dose and by the presence of ethylene and nitric oxide, but rose with $SnCl_4$ concentration to approach a limiting total value near 0.2. When ethylene was present, G(total C_9H_{12}) was near 0.01. When CCl_4 was substituted for $SnCl_4$, a different product pattern was found. Squalene was irradiated with Co^{60} γ-rays at room temperature and with 1-Mev electrons at 243° K. The main radiation-induced effects, with their G-values at room temperature, are loss of unsaturation (4.6), crosslinking (1.35), trans-cis isomerization (0.83), and hydrogen evolution (0.58). Increased yields (on the basis of energy absorbed in the solute) were observed for the cis-trans isomerization of squalene and cis- and trans-polyisoprene when these were irradiated in benzene solution. Author

N64-11752 Army Missile Command, Huntsville, Ala. Redstone Scientific Information Center
EXTRACTION-PHOTOMETRIC DETERMINATION OF PERCHLORATES IN THE PRESENCE OF CHLORATES
V. A. Golosnitskaya and V. I. Petrashen 1 Nov. 1963 12 p refs Transl. into ENGLISH from Zh. Analit. Khim. (USSR), v. 17, no. 7, 1962 p 878-881
(RSIC-90; AD-423962)

A new, rapid extraction-photometric method of determining perchlorates in the presence of chlorates, by using a brilliant green light, and the extractives benzene, toluene, and m-xylene, has been developed. The influence of ions ClO_3^-, ClO^-, Cl^-, Li^+, K^+, NH_4^+, Mg^{2+}, Ba^{2+}, $Cr_2O_7^{2-}$, CrO_4^{2-}, NO_3^-, NO_2^-, F^- was studied. The method permits the possibility of determining perchlorates in the presence of chlorates up to a 100 multiple proportion of their quantity, depending on the type of extractive used. Determination error comprises 0.06 to 0.15 mkg/ml. Author

N64-11802* Southern Research Inst., Birmingham, Ala. Organic Section
A STUDY OF POLYMERS CONTAINING SILICON-NITROGEN BONDS Progress Report 33, 4 Oct.-3 Nov. 1963
Robert E. Burks, Jr., and Thomas W. Ray 15 Nov. 1963 19 p refs
(NASA Contract NAS8-1510)
(NASA CR-52971) OTS: $1.60 ph, $0.80 mf

The investigation of N-alkali derivatives of cyclic silazanes was continued with attempts to form N-alkyl silazanes; no pure products were obtained. Triethylamine was found to have a desirable influence on the reaction of diphenyldichlorosilane with ammonia. The study of compounds with Si-N-Si units joined by phenylene groups was continued. Encouraging results were obtained with polymers made from starting materials in which methyl groups were attached to the silicon atoms and either methyl groups or hydrogen atoms attached to the nitrogen atoms. In both cases, the thermal stability was good. Two new polymers with interesting properties were produced from methylphenyldichlorosilane. Reaction with methylamine, followed by reaction with hydroquinone, produced a tough flexible polymer; reaction with aniline, followed by a prolonged heating in air, produced a polymer that was less tough but that recovered faster after deformation. Author

N64-11913 Army Missile Command, Huntsville, Ala.
DETERMINATION OF IRON IN ALUMINATE SOLUTIONS BY A POLAROGRAPHIC METHOD
N. A. Suvorovskaya 4 Jan. 1963 6 p refs Transl. into ENGLISH of an article from Zh. Prikl. Khim., (Moscow), v. 17, no. 3, 1944 p 156-158
(AMC-Transl.-1-63)

Iron is prepared for polarographic determination as follows. The iron is precipitated in the form of the sulfide, dissolved in HCl, and reduced by SO_2 during the boiling of the solution with Na_2S. $H_2C_4H_4O_6$ (tartaric acid) is added for retention of the iron as a complex within the solution. Twenty milliliters of a solution containing 200 milliliters of NH_4OH and 100 grams of $(NH_4)_2CO_3$ per liter was used as a regulating solution. Results indicate that: (1) The polarographic method of analysis for the determination of iron in aluminate solutions to be used in the preparation of alumina is a practical method. (2) This method is very precise and may be successfully applied for controlling the rapid calorimetric method for determining iron, developed by the Central Laboratory of the Ural Aluminum Works. I.v.L.

N64-11957 Hanford Atomic Products Operation, Richland, Wash.
DEVELOPMENT AND DEMONSTRATION OF AN ION-EXCHANGE PROCESS FOR KILOGRAM-SCALE PRODUCTION OF HIGH PURITY PROMETHIUM
E. J. Wheelright and F. P. Roberts Oct. 1963 43 p
(Contract AT(45-1)-1350)
(HW-78651 Rev) OTS: $1.00

A crude rare earth fission product mixture containing 20,000 curies of Pm^{147} (from which the cerium had been removed by a previous precipitation process) was processed through a multicolumn ion-exchange unit. Dowex 50W, X-8 (50 to 100 mesh) resin was used, and the rare earths were eluted with an NH_4OH buffered EDTA solution at elevated temperature. The distinguishing features of this process are the selection of a restraining ion and the elevated temperature operation, which permit purification of the promethium in a minimum amount of time, thus reducing resin radiolysis to an acceptable level. The promethium was recovered, radiochemically pure, in three fractions. The "heart" fraction, 13,000 curies, was 99% pure; the only contaminants were traces of neodymium and samarium. The second fraction, 3100 curies, contained 88% promethium, 1% samarium, and 11% neodymium. The third fraction, 4600 curies, was 55% promethium, 24% samarium, and 21% neodymium. The equipment and the operating conditions are described. Author

N64-11983 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS ON COMMUNIST CHINA'S SCIENCE AND TECHNOLOGY, NO. 62
Hsu Chikung et al 19 Dec. 1963 25 p refs Transl. into ENGLISH of an article from Hua Hsueh Tung-pao (Peiping), no. 3, Mar. 1963 p 15-23
(JPRS-22383; OTS-64-21073) OTS: $0.75

This report presents discussions on methods for preparing the following fluorine-containing monomers: (1) fluorinated vinyls, (2) fluorinated styrenes, (3) fluorinated butadienes, (4) fluorinated acrylates (esters), and (5) fluorinated polyester-type monomers. Also discussed is the preparation of monomers containing both fluorine and silicon. I.v.L.

N64-12038 Dynatech Corp., Cambridge, Mass.
STUDY OF OXIDES FOR O_2-N_2 SEPARATION Third Quarterly Progress Report, 15 Jul.-15 Oct. 1963

J. R. Turner 30 Oct. 1963 48 p refs
(Contract AF 33(657)-10797)
(Rept. 431; AD-422406)

Studies reported cover the following areas: (1) equilibrium measurements—Cu_2O-CuO system, and Mn_3O_4-Mn_2O_3 system; (2) reaction rate measurements—BaO-BaO_2 system, Mn_3O_4-Mn_2O_3 system, and cobalt oxide system; and (3) particle development—cobalt oxide particle development, barium oxide particle development, and coated particle development. R.T.K.

N64-12053 Doucette (E. I.) Associates, Inc., Chatham, N.J.
A QUANTITATIVE STUDY OF THE EVOLUTION OF GASES FROM ELECTRON TUBES AND MATERIALS Final Scientific Report, 18 Dec. 1962-18 Jun. 1963
W. J. Grubbs, G. H. Snider, and F. I. Scott 18 Jul. 1963 90 p refs
(Contract AF 19(628)-326)
(AFCRL-63-335; AD-424175)

A continuous quantitative and qualitative gas analysis system has been designed, built, and calibrated. The system incorporates an omegatron mass spectrometer, ion pumps, ionization gages, and precision orifices to measure the flow rate of individual gases. It has been used to examine several processing and materials parameters as they affect the kinds and quantities of gases evolved by electron tubes. CO_2, CO, and H_2 in roughly equal amounts comprise about 95% of the gas evolved during cathode conversion and activation. Author

N64-12078 Aerospace Information Div., Library of Congress, Washington, D.C.
TRACKING OF MISSILES AND SPACE VEHICLES. COMPILATION OF ABSTRACTS
4 Nov. 1963 26 p refs
(AID-P-63-118; AD-424026) OTS: $2.60 ph, $0.98 mf

This report presents papers dealing with the following main topics: (1) ion clouds and ionospheric perturbation; and (2) radio astronomy. I.v.L.

N64-12086 Air Force Systems Command, Wright-Patterson AFB Foreign Technology Div.
DERIVATIVES OF PERFLUORODICARBONIC ACIDS
I. L. Knunyants and M. P. Krasuskaya 26 May 1963 7 p refs Transl. into ENGLISH from Izv. Akad. Nauk., SSSR, [Otd. Khim. Nauk, Moscow] no. 1, 1963 p 190–192
(AD-409198; FTD-TT-63-463/1+2) OTS: $1.10

Bifunctional derivatives of perfluoradipic, perfluosebacic, and perfluododeca-methylene-dicarbonic acids were obtained by oxidation of perfluoroctadiene, perfluododecadiene, and perfluohexadecadiene, respectively. The method of preparing the chloranhydrides, esters, amides, nitriles, and amidines of each of these acids is discussed. J.E.T.

N64-12095 General Motors Corp., Indianapolis, Ind. Allison Div.
SURVEY OF APPLICABLE ELECTROCHEMICAL TECHNOLOGY. OPERATIONAL AND FABRICATION TECHNIQUES AND MATERIALS
Charles Tirrell (Electrodics, Inc.) Dec. 1963 20 p refs
(Contract AT(30-1)-3101)
(EDR-3687, Vol. 1)

Construction materials, cell configuration, and fabrication techniques for a mobile electrolysis unit are discussed. Cell construction materials have been considered from the standpoint of corrosion resistance in both acid and base electrolytes. Two electrolytes, sulfuric acid and potassium hydroxide, are presently under investigation. Metallic and rigid nonmetallic materials, which are resistant to both H_2SO_4 and KOH, are listed and classified according to the rate of electrolyte corrosion. Since plastic and other nonmetallic materials usually fail due to swelling and distortion, these materials are graded as good, fair, and unsatisfactory. Cell containers and auxiliary equipment, gasket and spacer material, and separators (porous inactive, nonporous inactive, porous active, and nonporous active separators) are also discussed. P.V.E.

N64-12122 Martin Co., Baltimore, Md. Space Systems Div.
HIGH TEMPERATURE OXIDATIVE DEGRADATION OF PHENOL-FORMALDEHYDE POLYCONDENSATES
W. M. Jackson and R. T. Conley Sep. 1963 39 p refs
(RR-46)

The degradation of phenol-formaldehyde polycondensates has been investigated at temperatures as high as 1000° C. It has been found that the primary degradation route of phenol-formaldehyde polycondensates, regardless of whether the resin is exposed to elevated temperatures in air, argon, or nitrogen, is oxidation. In this study, it was found that phenol-formaldehyde polycondensates of unusual thermal stability could be produced by high-temperature postcuring. The comparison of the oxidation rates of the resin cured at low temperature and this material indicates greatly improved oxidative stability, as well as resistance to thermal pyrolysis. This undoubtedly is due to the complete cross-linking of the resin system. Author

N64-12129 William H. Johnston Labs., Inc., Baltimore, Md.
SPECIAL REPORT ON OZONE FORMATION IN THE RADIOLYSIS OF OXYGEN
William H. Johnston et al · Washington, AEC, Div. of Tech. Inform., 5 Aug. 1963 62 p refs
(Contract AT(30-1)-2901)
(JLI-2901-0-1) OTS: $1.50

The chemistry and mechanistics of the radiolysis of gaseous oxygen are treated in a manner which imposes the special conditions of irradiation upon the general chemical system. The inclusion of a reaction unique to the radiolysis system was found to explain the apparently "too low" yields of ozone from oxygen radiolysis. The results obtained indicate some conditions necessary for maximizing the yield of ozone from the irradiation of oxygen in the gas phase. R.T.K.

N64-12131 Universal Match Corp., St. Louis, Mo. Unidynamics Div., Bio Sciences Labs.
INVESTIGATION OF THE EFFECTS OF IONIZING RADIATION ON SYNTHETIC DETERGENTS, SEWAGE COLLOIDAL CHARACTERISTICS AND SEWAGE SEDIMENTATION Final Report
6 Sep. 1963 109 p refs
(Contract AT(11-1)-905)
(D63-341; COO-275) OTS: $2.25

An investigation of the effects of ionizing radiation upon colloidal phenomena and upon the sedimentation of sewage was conducted. Gamma radiation doses as low as 1270 rad at a rate of 10.4 rad/min. effected a 6% increase in the sedimentation of simulated sewages. A dose of 13,200 rad at a rate of 296 rad/min. resulted in a sedimentation increase of 8%. Actual sewages were also investigated. An investigation of the radiation effects upon synthetic detergents indicated that gamma radiation could eliminate detergent foaming through a degradation of the detergent molecular structure. Studies of alkyl benzene sulfonate indicated that doses of less than 10,000 rad

destroyed 50% of the detergent in 14 ppm. solution, and that 90,000 rad had destroyed 99% of the detergent. Calculations indicated a "G" value of 3 for 50% removal and 1 for 90% removal. Author

N64-12135 Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia)
POLYMOLECULARITY OF IRRADIATION POLYMERIZED VINYLCHLORIDE
N. Vene Sep. 1963 4 p ref
(NIJS-R-417)

A diagram showing dB/dx versus c, the derivative at infinite dilution, for five samples of vinyl chloride polymerized by irradiation is presented. The width of the sedimentation curve, B, is defined as the quotient between the area and maximum height of the sedimentation curve. The polyvinylchloride samples were obtained by the irradiation of the monomer with gamma rays (Co 60) to different conversions. The diagram indicates that the polymolecularity increases with conversion and irradiation doses, and shows a certain dependance on irradiation intensities. P.V.E.

N64-12140 Joint Publications Research Service, Washington, D.C.
CHEMISTRY OF THE EARTH'S CRUST
A. P. Vinogradov, ed. 11 Dec. 1963 116 p Transl. into ENGLISH of a book "Khimiya Zemnoy Kory", Moscow, 1963 p 1–118
(JPRS-22225; OTS-63-41338) OTS: $2.50

CONTENTS:

1. GASEOUS CONDITIONS OF THE EARTH A. P. Vinogradov p 1
2. SOURCES OF INTRAPLANETARY HEAT Ye. A. Lyubimova p 1–2
3. VOLCANISM PHENOMENA AND THE UPPER MANTLE G. S. Gorshkov p 2–3
4. PRINCIPLES OF ZONAL MELTING AND ITS USE IN SOLVING SEVERAL GEOCHEMICAL PROBLEMS A. A. Yaroshevskiy p 3–5
5. EVALUATION OF THE POSSIBLE ROLE OF GRAVITATION IN THE DIFFERENTIATION OF MAGMAS IN THE HOMOGENOUS STATE A. A. Kadik p 5–6
6. POSSIBLE RELATIONSHIPS BETWEEN MAGMAS AND THE STRUCTURE OF THE OUTER MANTLE OF THE EARTH Yu. M. Sheynmann p 6–7
7. STRUCTURE OF THE EARTH IN LIGHT OF EXPERIMENTAL STUDIES AT HIGH PRESSURES S. M. Stishov p 7–9
8. BASIC MAGMATIC PROCESS IN THE LIGHT OF CRYSTALLOCHEMISTRY N. V. Belov p 9–12
9. EXPERIMENTAL INVESTIGATION OF OXYGEN PRESSURE, WATER CONTENT, AND ORDER OF CRYSTALLIZATION IN BASALTS AND ANDESITES E. F. Osborn p 13–14
10. THEORY OF THE CRYSTALLINE FIELD AND SEVERAL OF ITS GEOCHEMICAL APPLICATIONS R. G. Burns, R. H. Clark, and W. S. Fyfe p 14–15
11. IGNEOUS ROCK SERIES H. Kuno p 15–16
12. THEORY OF EXTREMAL STATES AND THEIR SIGNIFICANCE FOR MINERAL SYSTEMS D. S. Korzhinskiy p 16–17
13. EXTREMA OF SOME MINERAL EQUILIBRIA WITH RESPECT TO THE GEOCHEMICAL CONDITIONS OF METAMORPHOSIS AND METASOMATOSIS A. A. Marakushev p 17–18
14. APPLICATIONS OF EXPERIMENTAL DATA TO METAMORPHIC REACTIONS P. J. Wyllie p 18–19
15. ROLE OF HIGH PRESSURE IN METAMORPHOSIS V. I. Lebedev p 20–21
16. ORGANIC MATTER IN IGNEOUS AND METAMORPHIC ROCK I. A. Petersil'ye p 21–23
17. LEADING PHYSICOCHEMICAL DIRECTION IN THE PROCESS OF GRANITE FORMATION (USING THE EXAMPLE OF THE PRECAMBRIAN GRANITES OF THE EASTERN BALTIC SHIELD) A. A. Polkanov, V. A. Maslenikov, and K. A. Shurkin p 23–24
18. MECHANISM OF THE BEHAVIOR OF WATER AT THE INCREASED TEMPERATURES AND PRESSURES IN THE FORMATION AND CONVERSIONS OF SILICATES J. Wyart p 24–25
19. RAPID ANALYSIS OF ROCKS BY MEANS OF THE QUANTOMETER. APPLICATION OF GEOCHEMICAL RESEARCH TO SEVERAL GRANITE MASSIF OF FRANCE M. Roubault p 25–26
20. GEOCHEMICAL FEATURES OF RARE-METAL GRANITE PEGMATITES OF SAYAN Yu. S. Slepnev p 26–27
21. GEOCHEMICAL CHARACTERISTICS OF AGPAITE NEPHELINE SYENITES V. I. Gerasimovskiy p 27–29
22. BEHAVIOR OF ROCK-FORMING AND SEVERAL RARE ELEMENTS IN ALKALI ROCK FORMATION A. S. Pavlenko p 29–31
23. PHYSICOCHEMICAL EVOLUTION OF AN ALKALINE MAGMA OF THE DIFFERENTIATED COMPLEX OF THE LOVOZERSKIY MASSIF WITH RESPECT TO ITS RHYTHMIC STRATIFICATION L. N. Koiarko and V. P. Volkov p 31–32
24. ACIDIC-BASIC INTERACTION OF COMPONENTS IN MELTS WITH RESPECT TO PROBLEMS OF THE GENESIS OF ALKALI ROCKS L. V. Dmitryev p 32–33
25. BEHAVIOR OF IMPURITY-ELEMENTS IN THE PROCESS OF PHASE SEPARATION I. D. Raybchikov p 34–35
26. ELECTROCHEMICAL PROCESSES IN SULFIDE DEPOSITS AND THEIR GEOCHEMICAL SIGNIFICANCE G. B. Sveshnikov p 35–37
27. CAUSES OF THE FORMATION OF ORE PROVINCES A. I. Tugarinov p 38
28. GEOCHEMICAL ANALYSIS OF EFFECTS OF HIGH-TEMPERATURE POST-MAGMATIC METASOMATOSIS AND ORE-FORMATION IN GRANITOIDS A. A. Beus p 39
29. METALLOGENIC SPECIALIZATION OF GRANITOID INTRUSIONS V. L. Barsukov p 40–42
30. ELEMENT IMPURITIES AS INDICATORS FOR ORE-FORMATION, AND USE OF THE REGULARITIES IN THEIR DISTRIBUTION IN EXPLORING FOR ORE DEPOSITS L. N. Ovchinnikov p 42–43
31. ON THE ACIDITY-ALKALINITY OF HYDROTHERMAL SOLUTIONS A. A. Popov p 43–44
32. ESTIMATION OF THE PH VALUES OF CARBONATE HYDROTHERMS S. D. Malinin p 44–45
33. MAIN GEOCHEMICAL SETTINGS AND PROCESSES OF FORMING HYDROTHERMS IN THE REGION OF PRESENT-DAY VOLCANISM V. V. Ivanov p 45–47
34. BOUNDARIES OF ISOMORPHOUS MISCIBILITY AS A FUNCTION OF GENETIC CONDITIONS V. V. Scherbina and K. I. Yukubovich p 47–48
35. GEOCHEMISTRY OF RARE ELEMENTS IN EXTRUDED ROCKS AND METALLOGENIC SPECIALIZATION OF MAGMAS L. V. Tauson p 48–49
36. FEATURES OF THE CONCENTRATION OF RARE ELEMENTS IN ENDOGENIC PROCESSES A. I. Ginzburg p 49–51
37. HOMOGENEITY AND RANDOM RESULTS OF GEOCHEMISTRY D. M. Shaw p 51–52

38. TITANIUM IN MAGMATIC FORMATION OF THE ALTAI-SAYANSKAYA FOLDED REGION I. I. Abramorich and Ye. B. Vysokoostrovskaya p 52–53

39. GEOCHEMISTRY OF TITANIUM IN A HUMID SEDIMENTATION BASIN A. A. Migdisov p 53–54

40. TUNGSTEN, VANADIUM, THALLIUM, AND OTHER RARE ELEMENTS IN MANGANESE OXIDE DEPOSITS OF THE UNITED STATES, AND THEIR INTERRELATIONSHIPS WITH THE MINERALOGY AND GENESIS OF THESE DEPOSITS M. F. Fleischer and D. Hewitt p 55

41. SEGREGATION OF RARE-EARTH ELEMENTS IN THE MAGMATIC PROCESS Yu. A. Balashov p 55–56

42. MEAN NIOBIUM AND TANTALUM CONTENT IN GRANITOIDS Ye. B. Znamenskiy p 56–57

43. STUDY OF THE MINERALOGICAL AND CHEMICAL HETEROGENEITY OF RADIOACTIVE METAMICTIC NIOBOTANTALATES J. Orcel and D. Fauquier p 57–58

44. ATTEMPTS TO EXPLAIN THE FORMATION OF VADOSE MAGNESIUM MINERALS S. Caillere and S. Henin p 58–59

45. GEOCHEMICAL DIFFERENTIATION OF RARE-EARTH ELEMENTS A. D. Mineyev p 59–61

46. GEOCHEMISTRY OF SILVER R. W. Boyle p 61–62

47. DISTRIBUTION OF SOME UNCOMMON ELEMENTS IN ALKALI ROCKS OF THE SYENITE MASSIF OF DITREU V. Yanovich and Zh. P. Popescu p 62–63

48. DISTRIBUTION OF RARE ELEMENTS IN VOLCANIC ROCKS OF MUNTSIY GUTYY D. Dzhushka and Zh. Ponescu p 63

49. SEVERAL FEATURES OF THE GEOCHEMISTRY OF LEAD AND ZINC IN THE MAGMATIC HISTORY OF THE INTRUSIVE COMPLEX OF INCREASED POTASSIUM ALKALINITY R. D. Gavrilin and L. A. Pevtsova p 63–64

50. EVOLUTION OF MOLYBDENUM AND TUNGSTEN CONTENT IN THE ROCKS OF THE GEOSYNCLINAL ZONE OF THE NORTHERN CAUCASUS AND THE RELATION TO THE FORMATION OF ORE DEPOSITS Z. V. Studenikova p 64–66

51. GENESIS OF HYPERBASITES AND SOME FEATURES OF THE DISTRIBUTION OF RARE AND MINOR ELEMENTS L. F. Borisenko p 66–68

52. GEOCHEMICAL FEATURES OF THE BEHAVIOR OF THALLIUM AND RUBIDIUM IN GEOLOGICAL PROCESSES AND THEIR PETROGENIC IMPORTANCE N. T. Voskresenskaya p 68–69

53. EVOLUTION OF CHEMICAL AND MINERALOGICAL COMPOSITION OF SANDSTONES A. B. Ronov, M. S. Mikhaylovskaya, and I. I. Solodkova p 69–71

54. GEOCHEMICAL AND PETROGRAPHIC STUDIES AIMED AT EXPLAINING THE GENESIS OF COPPER-BEARING SHALE K. H. Wedepohl p 71–72

55. ORIGIN OF ALLUVIAL DEPOSITS IN THE WESTERN AND EASTERN COASTS OF INDIA V. Aswathanaragana p 72–73

56. CATAGENIC CHANGES IN PETROLEUM-BEARING CARBONATE ROCKS (USING THE EXAMPLE OF PALEOGENIC DEPOSITS OF CENTRAL ASIA) A. I. Osipova p 73–74

57. PRIMARY EFFUSIVE-SEDIMENTARY ORIGIN OF IRON-BEARING QUARTZITES (JASPILITES) M. S. Tochilin p 74–76

58. PHENOMENA OF THE SILIFICATION OF LIAS LIMESTONES IN NORTHERN MORVAN S. Caillere and F. Kraut p 76

59. CONDITIONS FOR THE FORMATION OF IRON MINERALS IN MARINE SEDIMENTS M. F. Stashchuk p 76–79

60. ROLE OF HUMIC ACIDS IN THE GEOCHEMISTRY OF URANIUM AND THEIR POSSIBLE ROLE IN THE GEOCHEMISTRY OF OTHER CATIONS A. S. Salie p 79–81

61. EVOLUTION OF THE COMPOSITION OF ARCTIC OCEANIC BASIN WATERS DURING THE UPPER PALEOZOIC AND MESOZOIC I. S. Gramberg and N. S. Spiro p 81

62. TYPES AND PALEOCHEMICAL CONDITIONS OF THE FORMATION OF SUB-SURFACE WATERS OF CALCIUM CHLORIDE COMPOSITION M. S. Gurevich p 81–84

63. MOUNTAIN SOLUTIONS P. A. Kryukov p 84–86

64. CHEMICAL COMPOSITION OF OCEANIC OOZE WATERS O. V. Shishkina p 86–87

65. ON THE MIGRATION OF HALOGENS IN SEDIMENTARY ROCK L. A. Gulyayeva and Ye. S. Itkina p 88–89

66. MIGRATION OF ELEMENTS THROUGH PHASES OF THE HYDROSPHERE AND ATMOSPHERE K. S. Sugawara p 89–90

67. ARGON, NITROGEN, AND HELIUM IN NATURAL GASES V. P. Savchenko p 90–91

68. MIGRATION OF GASES IN THE EARTH'S CRUST AND THEIR EXCHANGE WITH THE ATMOSPHERE V. A. Sokolov p 91–93

69. DETERMINATION OF THE AGE OF THE EARTH ACCORDING TO THE MOST ANCIENT MINERALS AND ROCKS E. K. Gerling, Yu. A. Shukolyukov T. V. Kol'tsova, I. I. Matveyeva, and S. S. Yakovleva p 93–94

70. METAMORPHISM AND GEOCHRONOLOGY OF THE PRECAMBRIAN L. V. Komlev p 94

71. USE OF ARGON METHOD FOR DETERMINING AGE IN MARINE GEOLOGY AND PALEOGEOGRAPHY A. Ya. Krylov and Yu. I. Silin p 95–96

72. SOME VIEWS ON RESEARCH STUDIES IN FRANCE IN THE FIELD OF NUCLEAR GEOLOGY AND GEOCHEMISTRY R. Coulomb p 96

73. DETERMINATION OF THE ABSOLUTE AGE OF SEDIMENTARY ROCKS BY MEANS OF GLAUCONITES G. A. Kazakov p 97–98

74. SOME PROBLEMS OF GEOCHEMISTRY AND RADIOACTIVE ISOTOPES I. Ye. Starik, Yu. V. Kuznetsov, Ye. P. Petryayev, and V. K. Legin p 98–99

75. RADIOACTIVITY OF OCEAN DEPOSITS V. I. Baranov and L. A. Khristianova p 99–100

76. NEUTRON STUDY OF SOME URANIUM AND THORIUM MINERALS G. V. Gorshkov and O. S. Tsvetkov p 100–101

77. DISTRIBUTION OF SULFUR ISOTOPES IN ANCIENT SEAS, BASED ON STUDY OF THE EVAPORITES IN SEDIMENTARY BEDS H. Tohde and I. Munster p 101–102

78. DISTRIBUTION OF SULFUR ISOTOPES IN DEPOSITS OF THE SAXONY ORE MOUNTAINS O. Oelsner p 102–103

79. CHANGES IN THE ISOTOPIC SULFUR COMPOSITION IN PETROLEUM AND GASES AS A FUNCTION OF THE AGE OF THE SURROUNDING DEPOSITS N. A. Yeremako and R. G. Pankina p 103–104

80. FRACTIONATION OF STABLE SULFUR ISOTOPES IN BACTERIAL OXIDATION-REDUCTION REACTIONS V. L. Mekhtiyeva, R. M. Kondrat'yev, and M. N. Churmanteyeva p 105

81. SIGNIFICANCE OF THE O^{18}/O^{16} and C^{13}/C^{12} RATIOS IN HYDROTHERMAL-DOLOMITIZED LIMESTONE AND MANGANESE CARBONATE METASOMATIC ORES T. S. Lovering p 106

82. EXPERIENCE IN USING OXYGEN ISOTOPIC RATIOS IN GEOCHEMICAL RESEARCH Ye. I. D. Dontsova p 107

83. QUANTITATIVE INTERPRETATION OF THE DISTRIBUTION OF ANOMALOUS LEAD ISOTOPES R. D. Russell, E. R. Kanasewish, and R. G. Ostic p 108

N64-12229 Air Force Systems Command, Wright-Patterson AFB, Ohio AF Materials Lab.
EFFECTIVE SHIELDING VALUES OF THE PHENYL GROUP IN SOME GROUP IVb AND Vb COMPOUNDS Technical Documentary Report [Oct. 1962-Jun. 1963]
M. T. Ryan and W. L. Lehn Oct. 1963 14 p refs
(ASD-TDR-63-832; AD-423846)

The effective shielding values of the phenyl group in silanes, germanes, stannanes, amines, phosphines, and arsines are calculated from the proton magnetic resonance frequencies of protons attached to the group IVb or Vb element. The effective shielding of the phenyl group appears to be dependent on the electronegativity of the element to which it is bonded. The application of an additivity rule in calculating the frequency of protons in substituted silanes is shown. Author

N64-12267 Florida U., Gainesville
FLUOROCARBON N-F COMPOUNDS Seventeenth Quarterly Technical Report
R. D. Dresdner, J. Merritt, and J. S. Johar 1 Oct. 1963 11 p refs
(Contract DA-01-009-ORD-772; ARPA Order 40-59)
(AD-423084)

A more productive method to prepare $CF_3N = SF_2$ from SF_4 and NaSCN in at least 57% yields is reported. From this material, a sample of the new homolog, $CF_3N{=}SF(iC_3F_7)$ has been prepared. Its properties are reported. All 3 available homologs of $R_fN{=}SF_2$, where R_f is CF_3, C_2F_5, or C_3F_7, have been reacted with N_2F_4 to produce at least 65% yields of NF_2SF_5 when irradiated with ultraviolet light. No reaction is observed with these same materials in a steel vessel at temperatures up to 120° C and pressures up to 293 psi. Author

N64-12280 Emmanuel Coll., Boston, Mass. Research Language Center
INVESTIGATIONS IN A PYRIDYLTHIAZOLYLMETHANE SERIES [ISSLEDOVANIIA V RIADU PIRIDILTIAZOLILMETANA]
V. G. Ermolaeva and M. N. Shchukina Apr. 1963 20 p refs Transl. into ENGLISH of an article from Zh. Obshch. Khim. (Moscow), 1962 p 2664-2670
(Contract AF 19(604)-8505)
(E-T-R-63-5; AD-414857) OTS: $1.60

A brief study was conducted concerning the derivatives of pyridylthiazolylmethane to ascertain the physiologically active substances and also to investigate the effects of the pyridine and thiazol radicals of the chemical properties of such methane substitutes. Also included was a study of the chemical properties of the pyridylthiazolylcarbinols, which can be considered analogous to benzhydrol, whose radical is contained in the structure of a number of highly active substances. C.L.W.

08 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; telemetry; tracking; and wave propogation. *For tracking stations see*: 10 Facilities, Research and Support. *For related information see*: 06 Auxiliary Systems; 09 Electronics; 15 Instrumentation and Photography; and 22 Navigation and Guidance.

N64-11443 Stanford Research Inst., Menlo Park, Calif.
AIRCRAFT PROPELLER CORONA THRESHOLD AND ITS EFFECT ON PRECIPITATION STATIC NOISE REDUCTION
E. F. Vance and J. E. Nanevicz Nov. 1963 90 p refs
(Contract AF 19(628)-325)
(SRI-TR-77; AFCRL-63-511; AD-423414)

The aircraft potential at which the propellers go into corona is determined as a function of aircraft size, propeller size, and engine location. The propeller threshold potentials are used with data from earlier precipitation static studies to calculate the number of passive dischargers required to handle a given charging rate, without interference from propeller corona. In general, it is found that, unless the propellers are modified to prevent or decouple noise produced by propeller corona, a very large number of dischargers is required to provide noise reduction on a propeller aircraft, comparable to the noise reduction obtained with 21 dischargers on a jet transport. Some possible methods of preventing propeller corona noise are discussed. The problems of discharging helicopters and other hovering aircraft are also discussed. Author

N64-11517* National Aeronautics and Space Administration, Washington, D.C.
DEVELOPING AND MAINTAINING OPEN CHANNELS OF COMMUNICATIONS BETWEEN THE LABORATORY, INDUSTRY, AND THE COMMUNITY
George L. Simpson, Jr. *In its* Conf. on Space, Sci., and Urban Life, Oakland, Calif., 28-30 Mar. 1963 p 161-172 (See N64-11502 03-01) GPO: $1.75

Communication between the laboratory, management, and the community is necessary for use of research and scientific knowledge to solve the problems of metropolitan areas. The opinion was advanced that a national organization cannot provide effective communication leading to local action, but that communication must stem from a local source in which confidence must be built. C.L.W.

N64-11540 Lockheed Missiles and Space Co., Sunnyvale, Calif.
RFI TESTING FROM 200 Mc TO 10 Gc: AN ANNOTATED BIBLIOGRAPHY
Eugene E. Graziano, comp. Jun. 1963 32 p refs
(Contract AF 33(657-9145)
(LMSD SB-63-48)

This selective bibliography of 79 items is the product of a search of the world literature for the period January 1955 to May 1963. Of particular interest were testing methods and procedures for the detection and measurement of conducted and radiated RFI in the range 200 Mc to 10 Gc. Testing procedures for component susceptibility and RFI generation in these same electromagnetic ranges were of equal interest. Author

N64-11589 Royal Aircraft Establishment, Farnborough (Gt. Brit.)
THE 70 MC/S FREQUENCY MODULATOR [70 MHZ FREKVENSMODULATOR]
Herman Daae London, Min. of Aviation Oct. 1963 10 p refs Transl. into ENGLISH from ETT, v. 76, no. 4, 1963 p 61-63
(RAE-TRANS-1048)

A brief description is given of an experimental 70 Mc/s frequency modulator with wideband characteristics. Frequency modulation is obtained by varying the mutual conductance of two cathode-followers in an oscillator chain, whereas the baseband signal is subject to strong negative feedback. Frequency

deviation versus baseband input is constant to within 0.5 dB from 10 c/s to 15 Mc/s. Linearity of the present model is suitable for 600 telephone channels with CCIR quality. Author

N64-11757 Syracuse U. Research Inst., N.Y.
RADIATION CHARACTERISTICS OF A SIDE FIRE HELICAL ANTENNA
J. Perini Griffiss AFB, N.Y., Tech. Lab. Oct. 1963 25 p refs
(Contract AF 30(602)-2646)
(RADC-TDR-63-360; AD-423185)

This antenna consists of a vertical conducting cylinder 5λ long, and two conducting helices of larger diameter wrapped around it, with opposite pitches starting at half of the cylinder length—the feed point—and progressing toward the ends. It radiates primarily in a horizontal polarized field. The horizontal pattern is approximately circular, and the vertical forms a beam of 12° (gain 5). The bandwidth is over 10 percent. It has only one feed point on the 5λ aperture. It is very easy to build, self-supporting, easily stacked to form an array, and can be used as self-diplexing. An exponentially decaying traveling current is assumed on the helices. The Fourier transform method for reducing the problem to a two-dimensional one was used successfully. Computed and experimental data are presented and show good agreement. Author

N64-11760 Air Force Cambridge Research Labs., Bedford, Mass. Electromagnetic Radiation Lab.
MODERN ANTENNAS FOR SPACE COMMUNICATIONS Research Report
C. J. Sletten Feb. 1963 55 p refs
(AFCRL-63-51; AD-403987) OTS: $5.60

The design principles and merits of large-acreage antennas such as spherical reflectors, paraboloidal reflectors, parabolic cylinder antennas, flat antenna arrays, and interferometers are reviewed, with particular attention to the new multiplate antenna design. The electronic scanning methods of antennas and arrays that are compared include some advanced designs for nonlinear antennas. New techniques of multibeam generation and antenna pattern optimization are suggested for improving the aperture efficiency and information-gathering capacity of future radio and radar space telescopes. Author

N64-11812* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TELEMETRY DATA PROCESSING FOR THE ECCENTRIC ORBITING GEOPHYSICAL OBSERVATORY SATELLITE
R. Coates, C. Creveling, E. Habib, M. Mahoney, and C. Stout Oct. 1963 21 p refs
(NASA TM X-51259; NASA X-545-63-212) OTS: $2.60 ph, $0.83 mf

The Eccentric Orbiting Geophysical Observatory (EGO) is being designed to have PCM telemetry data rates of 1000, 8000, or 66,000 bits/sec, selectable by ground command. This satellite will have onboard data storage for low-speed data (1000 bits/sec) plus about 40 percent ground station coverage of each orbit for data acquisition at any of the bit rates. The program planned for the first EGO satellite anticipates receiving an average of 6000 bits/sec for a period of 6 months, or a total of about 10^{11} bits. The high-speed data processing system for this high volume of data consists of two processing lines plus a large-scale digital computer. The processing lines convert the analog recordings of the PCM telemetry signals to digital magnetic tapes in computer format. The computer then performs quality control and decommutation of the data into separate digital tapes for each experimenter. Author

N64-11824 Weapons Research Establishment (Australia)
A DATA LINK OSCILLATOR FOR USE IN A ROCKETBORNE METEOROLOGICAL DROPSONDE
C. J. Beach Jul. 1963 12 p refs
(Tech. Note SAD-130)

A data link oscillator working in the frequency range of 400 to 450 Mc has been developed for use in a rocketborne dropsonde for upper atmosphere research studies. This oscillator, after being satisfactorily subjected to environmental testing, has been successfully flown in two high-altitude rocket trials.
Author

N64-11857 Joint Publications Research Service, Washington, D.C.
ULTRA-HIGH-FREQUENCY ELECTROMAGNETIC WAVES OF THE DECKS OF MERCHANT SHIPS
Ye. L. Kulikovskaya (Labor Hyg. and Occupational Disease Inst., Leningrad) *In its* Transl. on Hyg. and Safety 6 May 1963 p 1-5 (See N64-11856 03-01) OTS: $0.50

The crews of ships equipped with modern radio stations may be exposed to the effects of the ultrahigh frequency emission field of varying and, sometimes, quite appreciable intensity. All other conditions being equal, the irradiation intensity at different points on deck and bridge depends upon the altitude of the antenna above the upper bridge of the ship, and the architectural features of the latter. From a hygienic standpoint, the height of the antenna comprising 4.5 metres for merchant ships is considered to be insufficient. Author

N64-12026* Space Technology Labs., Inc., Redondo Beach, Calif.
PRACTICAL ASPECTS OF DATA PROCESSING AND ENCODING FOR SPACE COMMUNICATIONS
George E. Mueller [1963] 26 p refs
(NASA CR-55017) OTS: $2.60 ph, $0.98 mf

The methods for processing and encoding data from spacecraft and the mission requirements imposed on these spacecraft are discussed. The characteristics of the spacecraft communication links are given for Mariner, Relay, Syncom, TIROS, Ranger 6-9, OAO (Orbiting Astronomical Observatory), OGO (Orbiting Geophysical Observatory), and Surveyor. The four factors considered in the process of translating measurements and events into a form suitable for telemetry transmission are filtering, encoding, the choice of format for the code, and the capability for decoding. R.T.K.

N64-12052 Air Force Cambridge Research Labs., Bedford, Mass.
SIMULATION EXPERIMENTS IN TWO-WAY CONTROLLED CARRIER TRANSMISSION
Ronald J. Massa Oct. 1963 50 p refs
(AFCRL-63-159 (Rev.); AD-423700)

A controlled carrier system, the power reductions due to controlled carrier transmission, and the results of an analog computer simulation demonstrating various aspects of controlled carrier operation are discussed. In addition, communication performance improvements in tropospheric scatter systems that may be obtained through the use of controlled carrier are cited, and related to corresponding improvements obtained with diversity and coding. Author

N64-12076 Pennsylvania Research Associates, Inc., Philadelphia
INVESTIGATION OF DIGITIAL TECHNIQUES FOR RADAR LAND MASS SIMULATION

23 Aug. 1963 206 p
(Contract N61339-1025)
(NAVTRADEVCEN 1025-2; AD-424625)

The present report includes discussion of two basic methods of representing natural terrain in digital form—function approximation and contour interpolation. It formulates a model for the encoding and preparation of map data and for equipment to reconstruct terrain profiles in real-time synchronism with the display of an airborne radar. Author

N64-12157* ADCOM, Inc., Cambridge, Mass.
SELECTION OF SIGNALS FOR SPACE-VEHICLE COMMAND
Elie J. Baghdady 1 Jun. 1963 68 p
(NASA Contract NAS8-2668)
(NASA CR-55086) OTS: $6.60 ph, $2.24 mf

A survey of the types, requirements, and techniques of command signal design is presented. The material provides a basis for conceiving and evaluating specific signals for special command purposes and provides a guide for the classification of command signals. R.T.K.

N64-12165 National Bureau of Standards, Boulder, Colo.
BIBLIOGRAPHY ON ATMOSPHERIC ASPECTS OF RADIO ASTRONOMY
Wilhelm Nupen 1 May 1963 453 p 1013 refs Meteorol. and Geoastrophysical abstracts prepared by Am. Meteorol. Soc.
(NBS-TN-171) Available from GPO

This annotated bibliography contains references from the literature published between 1900 and 1961, inclusive, but the bulk of the literature follows the discovery by Jansky in 1932 of radiofrequency radiation from the sun, and especially the building of radio telescopes since World War II. The subject matter is confined to: (1) the effects of the earth's atmosphere on radiofrequency radiation from the sun, planets, stars, the galaxies, and intergalactic space; and (2) knowledge of atmospheric or ionospheric structure, composition, or physics. R.T.K.

N64-12172 RAND Corp., Santa Monica, Calif.
PERISCOPE ANTENNA SYSTEMS WITH OPTIMALLY CURVED REFLECTORS
Edward Bedrosian Nov. 1963 30 p refs
(Contract AF 49(638)-700; Proj. RAND)
(RM-3930-PR; AD-423764)

Microwave radio relay systems frequently employ periscope antennas to avoid long cable runs to tower-mounted antennas. Early periscope antennas used flat reflector plates, whereas modern systems employ curved reflectors which, in effect, focus the incident energy to achieve additional gain. Analyses of the flat and paraboloidally curved reflectors are available in the technical literature, but the latter analysis does not incorporate a model of curvature which is optimum for certain ranges of the antenna system parameters. The analysis presented here develops a criterion for optimum curvature of the reflector. The resulting optimum gain is computed and seen to be equal to or greater than that available from the comparable flat or paraboloidal reflector. Typical wavefronts at the reflector are also computed and presented as aids in determining the optimum curvature required. Author

N64-12174 Aeronautical Systems Div., Wright-Patterson AFB, Ohio
REMOTE AIRBORNE TELEVISION DISPLAY OF GROUND RADAR COVERAGE VIA TACAN (RATAC)
Bert W. Sullivan Sep. 1963 38 p
(ASD-TDR-63-730; AD-422426)

The purpose of this flight test program was to test the feasibility of a remote airborne television display of ground radar coverage via a TACAN (RATAC) data link. This equipment was designed to give the pilot the same radar information seen by the ground radar station operator. With the aid of radar maps and different radar beacon modes, the pilot is able to identify his own aircraft radar target and navigate through a given airspace without the use of ground radar control. He is also capable of confirming the existence of other aircraft radar targets in his vicinity to a radar control station. Printed matter in the form of Alpha Numerics were also transmitted to the aircraft to demonstrate the feasibility of passing on to the pilot such instructions as flight clearances, weather information, and other NOTAMS as may be necessary. Flight tests made on the RATAC program demonstrated that the equipment is feasible, but it had some limitations which can be corrected. These limitations were caused by unfavorable television transmitter characteristics such as poor frequency stability and nonlinearity in the amplitude modulation of the radiofrequency carrier wave. Author

N64-12186 Aerospace Corp., El Segundo, Calif. Labs. Div.
INVESTIGATION OF MILLIMETER-WAVE MODULATION AND SIGNAL PROCESSING TECHNIQUES Semiannual Technical Report, 1 Jan.-30 Jun. 1963
L. A. Hoffman, H. J. Wintroub, and C. J. Carter 31 Oct. 1963 29 refs
(Contract AF 04(695)-169)
(TDR-169(3250-45)TR-1; SSD-TDR-63-258; AD-424014)

The purpose of this investigation is to advance the technology and determine the feasibility of millimeter-wave communication systems in the region between 10 mm (30 Gc) and 1 mm (300 Gc). Initial effort centers on two problem areas: low-noise receiver front ends and stable millimeter-wavelength reference sources. A parametric amplifier approach to low-noise receiver design is being studied, as is the use of a phase-locked klystron system, as a possible stable reference source. Fabrication and design status of the klystron system is presented. Author

N64-12190 Aerospace Corp., El Segundo, Calif. Engineering Div.
PHASE-LOCK DEMODULATION OF SINUSOIDAL FM
F. F. Yates 20 Nov. 1963 12 p refs
(Contract AF 04(695)-269)
(TDR-269(4111)-6; SSD-TDR-63-214; AD-425734)

Phase-Lock demodulation of an FM signal, where the modulating function is a sinusoid, is treated as a problem in tracking a sweeping carrier. An expression is obtained for the maximum output signal-to-noise ratio $(S/N)_o$, versus the input signal-to-noise density ratio in an information bandwidth (P_s/nB), under conditions of a solid loop lock. A similar expression is derived for threshold conditions. Author

N64-12252 Norwegian Defence Research Establishment, Kjeller
A DOPPLER TRACKING SYSTEM FOR SMALL ROCKET TRAJECTORIES
B. Bjelland Jun. 1963 30 p refs
(Contract AF 61(052)-599)
(FFIT Intern. Rept. E-14; AFCRL-63-746; AD-422879)

In this report a tracking system based upon Doppler shift on the modulating frequency of an AM-wave is described. Calculations based upon the time-marked Doppler data give the trajectories for well-behaved rockets with a sufficient degree of accuracy. Up to the present, the equipment has been used for tracking three Nike-Cajun rockets. The method of trajectory calculations is given, and calculation of an actual trajectory is performed. Author

N64-12258 Ohio State U. Research Foundation, Columbus Antenna Lab.
RESEARCH ON THE APPLICATION OF THE LUNEBERG LENS TO ECM ANTENNA SYSTEMS Interim Engineering Report, 1 Jun.-31 Aug. 1963
J. F. Rippin, Jr. 1 Sep. 1963 20 p
(Contract AF 33(657)-7829)
(Rept. 1394-10; BPSN-63-P6399; AD-422051)

The multiple beam capability of geodesic lens antennas is being investigated. The narrow flush feeds which are tested on a lens model preclude mechanical blocking in the lens and provide close overlap of adjacent beams. The influence of adjacent feeds on the radiation patterns and the gain of the lens is measured. The radiation patterns of a lens antenna depend on the element pattern of the lens aperture. A method for calculation of the element pattern is described in which the geometrical theory of diffraction is used to determine diffraction from the edges of the lens plates. Author

N64-12289 Parke Mathematical Labs., Inc., Carlisle, Mass.
DECODING RULES FOR KAUTZ'S CODES Scientific Report No. 8
H. G. Haefeli Oct. 1963 24 p refs
(Contract AF 19(604)-7493)
(Rept. 7493-SR-8; AFCRL-63-514; AD-424051)

This report presents decoding rules which can be applied to any Kautz's code and which correct any number of scattered errors as well as any error burst within the theoretical performance of the code. The solution of the decoding problem at such a level of generality is mainly of theoretical interest. Its practical importance comes from the possibility of introducing modifications to shorten the decoding work by considering only subclasses of codes, or by requiring correction of more limited numbers of errors (e.g., in systems incorporating the possibility of requesting repeats). Author

N64-12296 Brown (D.) Associates, Inc., Eau Gallie, Fla.
STUDY OF THE FEASIBILITY OF ROCKET AND SATELLITE APPROACHES TO THE CALIBRATION OF TRACKING SYSTEMS Final Report
Duane C. Brown, Norman Bush, and Jerome L. Sibol 23 Oct. 1963 222 p refs
(Contract AF 19(604)-8493)
(AFCRL-63-789; AD-425480)

The problem of calibration of tracking systems is reviewed at length, and a specific approach to calibration is defined. Self-calibration is held forth as the logical primary goal of a program of calibration. The prerequisites to self-calibration are established, and specific means for testing the concept are proposed. Results of extensive numerical simulations of postulated rocket and satellite calibration programs of MISTRAM, GLOTRAC, and C-Band RADARS are reported. Special consideration is given to problems of geodetic survey. Relative costs of satellite and rocket approaches are investigated. The overall conclusion is reached that both satellite and rocket programs of calibration are feasible, if properly designed, but that a satellite program would yield appreciably superior results at far less cost than a rocket program of comparable effectiveness. Author

N64-12304 Federal Scientific Corp., New York, N.Y.
A STUDY OF SIGNIFICANT PARAMETERS OF SPEECH FOR APPLICATION IN AUTOMATIC SPEECH RECOGNITION SYSTEMS Final Report
Mark R. Weiss 1 Jul. 1963 259 p refs
(Contract AF 30(602)-2333)
(FSC-T-4/114; AD-423279)

As part of the program, high-resolution spectrum analyses were obtained as a function of time for each of 7500 spoken words, automatically converted to digital form, and recorded on magnetic tape. The recorded spectra were then processed by a digital computer for which a program was written for the extraction of parameters of speech. The selection of the speech data, the system for obtaining and recording the speech spectra, and the computer program for reduction of the spectra are described. Results of statistical analyses of parameters extracted from 500 of the words are presented and discussed. The results obtained have provided insight into some of the statistical characteristics of basic parameters of speech, and into some of the influences of the manner of speaking on the values assumed by these parameters. Author

N64-12307 National Bureau of Standards, Boulder, Colo.
HIGH FREQUENCY PHASE STUDIES
Donald R. Macken Griffiss AFB, N.Y., Space Defense Systems Lab., Nov. 1963 50 p refs
(Contract AF 30(602)-2488)
(RADC-TDR-63-389; AD-287785) OTS: $2.60

From May 1962 through January 1963, recordings were made of relative signal intensity, fade rate, azimuthal direction of arrival, and changes in phase path length of an HF signal propagated over a great circle distance of 4400 km. Diurnal and short-term changes in phase path length which were observed are reported. Where possible, the changes in phase path length are correlated with solar flare activity and with possible traveling ionospheric disturbances. Author

N64-12396* Electromagnetic Research Corp., College Park, Md.
ON THE ELECTROMAGNETIC GREEN'S FUNCTION FOR A HOMOGENEOUS ANISOTROPIC MEDIUM AND CERTAIN OF ITS APPLICATIONS TO ANTENNA THEORY Scientific Report No. 4
W. S. Ament 28 Feb. 1963 28 p refs
(NASA Contract NAS5-585)
(NASA CR-55102; NAS-585-7) OTS: $2.60 ph, $1.04 mf

This report deals with some general properties of the dyadic Green's function **G** for oscillatory electromagnetic waves in a homogeneous anisotropic medium, and with aspects of the theory of antennas in such a medium. We first give the Fourier representation of **G**(**x**), a triple integral representing a superposition of plane waves of various propagation vectors **k**. With this representation we show that **G** is an even function of its spatial argument **x** and that when the representation is written in terms of spherical coordinates in k-space, the radial integral, over a positive R-axis, can be extended to the full R-axis. From the Fourier representation we also argue that a closed-form expression for **G** is generally unobtainable. We then consider the complex power and the variational prescriptions for calculating the input impedance of perfectly conducting antennas fed at a thin slit. For the anisotropic medium the latter prescription loses its variational efficacy to the extent that **G**, as a dyad, is nonsymmetric, as is the case for the magnetosphere. When all currents in the antenna can be assumed mutually parallel, the antisymmetric part of **G** has no effect and the variational form is again powerful for antenna current and impedance estimates. Author

N64-12399* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATTENUATION IN RE-ENTRY COMMUNICATIONS Plans Office Technical Report No. 2
F. J. Tischer 19 Jun. 1962 63 p refs
(NASA TM X-51027; NASA X-520-62-92) OTS: $6.60 ph, $2.09 mf

Methods are presented for computing the approximate attenuation of radio signals passing through the shock layer of large reentry vehicles. A review of the computation methods and of the availability of data for these computations shows that approximate methods with simplifications distributed evenly over all phases of the computations represent, at present, the best approach to obtain estimates for the reentry "blackout." Based on this concept, approximate equations are derived for the reentry attenuation. The derived equations are then applied to the MA-6 Mercury flight.

Author

09 ELECTRONICS

Includes circuits and circuit theory; electronic components (e.g., tunnel diodes, transistors, and tubes); and feedback and control theory. *For related information see*: 06 Auxiliary Systems; 08 Communications; 15 Instrumentation and Photography; 22 Navigation and Guidance; and 25 Physics, Solid-State.

N64-11530 Joint Publications Research Service, Washington, D.C.
SELF-ORGANIZING SYSTEM WITH POSITIVE FEED-BACKS
O. G. Ivakhnenko *In its* Translations from Avtomatyka (Automation), v. 7, no. 3, 1962 18 Feb. 1963 p 1–31 refs (See N64-11529 03-01) OTS: $2.25

Two basic principles of control—the principle of open control by perturbations (signals), and the principle of feedback according to the output quantities (summation effect)—are discussed. The systematic consideration of all principal types of self-organizing systems shows that they are all constructed according to these two principles. The most advanced self-organizing system is one that utilizes both principles of control.

R.T.K.

N64-11537 Purdue Research Foundation, Lafayette, Ind.
THE SCATTERING OF ELECTROMAGNETIC WAVES BY PERFECTLY REFLECTING OBJECTS OF COMPLEX SHAPE Final Report
F. V. Schultz, D. M. Bolle, and J. K. Schindler Jan. 1963 73 p refs
(Contract AF 19(604)-4051)
(TR-EE63-8; AFCRL-63-319; AD-276454)

A theoretical and numerical analysis was made to determine the radar cross-section of a perfectly conducting cone of finite height. Rigorous electromagnetic theory was used in the solution. The incomplete results obtained are compared with experimental and asymptotic theoretical results obtained elsewhere. An introductory investigation was made of methods of reducing the radar cross-section of a body by the use of reactive elements. Also investigated were methods of reducing the radar cross-section of an object by appropriately shaping the object.

Author

N64-11542 General Telephone and Electronics Labs., Inc., Bayside, N.Y.
STUDY OF FAILURE MECHANISMS IN HIGH-POWER RADIO FREQUENCY GENERATING DEVICES
M. Freidman Axler and R. A. Hein Griffiss AFB, N.Y., Applied Res. Lab., Oct. 1963 49 p refs
(Contract AF 30(602)-3018)
(RADC-TDR-63-423; AD-424589)

The aim of this investigation is to determine failure mechanisms caused by residual gases in traveling-wave tubes, and to find means of eliminating these gases in order to improve tube reliability. Correlation of gas spectra with electric characteristics during life test is shown. Gas sorption phenomena for a heater filament, a component that has proven to be a major source of gas, are presented.

Author

N64-11545 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Tech. Div.
PHASE VELOCITY OF ELECTROMAGNETIC WAVES IN THE RANGE 1–25 KCPS
G. A. Mikhaylova and T. I. Kurakina 20 Sep. 1963 8 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 3, no. 2, 1963 p 223–226
(FTD-TT-63-807/1+2; AD-422758)

The average phase velocity of electromagnetic waves in the range 1 to 25 kc has been obtained through harmonic analysis of radio disturbances recorded simultaneously in Moscow and Leningrad in the daytime from distances $r > 1,000$ km. The character of the dependence of $\overline{v}/c$ on the frequency obtained by a method which excludes the source of the signals coincides with the results of preceding projects which take into consideration the standard source of the kind $E = e^{-\alpha t} - e^{-\beta t}$ with $\alpha = 10^3$ and $\beta = 10^5$. The absolute value $\overline{v}/c$ within the precision of the measurements also agrees well. At the frequencies $f > 5$ kc, the experimental values of $\overline{v}/c$, with a precision up to 0.5%, coincide with the theoretical ones computed for a plane model of the ionosphere.

Author

N64-11571 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
ON THE GENERAL THEORY OF LINEAR FILTERS
N. S. Landkof [1963] 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Mat. v. 147, no. 4, 1962 p 776–778
(MH Transl. 425)

The linear filter is a device which transforms the "input" x(t) into the "output" y(t) according to the formula

$$y(t) \int_0^z x(t-\tau)\, dU(\tau).$$

Author

N64-11750 Michigan U., Ann Arbor Electron Physics Lab.
NOISE CHARACTERISTICS OF HIGH-POWER MICROWAVE AMPLIFIERS
H. W. Krage, Jr. (B. S. Thesis) Griffiss AFB, New York, Techniques Lab., Oct. 1963 146 p refs
(Contract AF 30(602)-2834)
(Tech. Rept.-62; RADC-TDR-63-428; AD-424434)

The space-charge wave analysis of noise in high-power traveling-wave amplifiers and Crestatrons is developed for large C values under the assumptions of small-amplitude signals and single-velocity models. The coupled-mode analysis is used to study noise propagation between the electron gun anode and the RF circuit on a two-wave basis. The results of this analysis suggest various noise reduction techniques appropriate for the Crestatron which operates on a beating-wave principle. Experimental confirmation of the predictions is excellent. Several Crestatrons were constructed in which noise figures approached theoretical values of 6 to 10 db.

Author

N64-11751 Microwave Associates, Inc., Burlington, Mass.
LONG LIFE K-BAND DUPLEXER Fourth Quarterly Technical Report, 1 Apr.–1 Jul. 1963
R. Brunton 7 May 1963 51 p refs
(Contract DA-36-039-SC-90834)
(AD-423267)

The technical efforts have been directed toward a limiter which will incorporate both the TR tube and semiconductor device. The TR tube will be a long-life gas TR to be operated without keep-alive voltage. The semiconductor limiter will follow the TR tube and attenuate the leakage power of the TR tube to the extent where overall limitering of the TR tube and semiconductor limiter meet the contract leakage power and loss requirements. Author

N64-11765 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ATTACHMENT FOR MEASURING SMALL TIME INTERVALS
S. S. Vetoshkin and B. C. Rozov 7 May 1963 11 p refs Transl. into ENGLISH of an article from Avtomat. i Telemekh. (Moscow), no. 2, 1962 p 49–59
(FTD-TT-63-149/1+2; AD-409272) OTS: $1.10

A device for measuring small time intervals is described. The device consists of two input blocks, a primary transformer, a memory device, a comparison circuit, a delay, and a sawtooth generator. I.v.L.

N64-11774 Philco Corp., Lansdale, Pa.
PEM FOR TRANSISTOR MANUFACTURING PROCESS IMPROVEMENT Fifth Quarterly Progress Report, 1 May-31 Jul. 1963
J. Sanders [1963] 80 p
(Contract DA-36-039-SC-86720)
(AD-423881)

Considerable storage and life test data have accumulated on standard production transistors. Failure rates are computed from these data to three sets of endpoints (initial, normal and degradation), and failure rate versus junction temperature curves are shown. Preliminary data are reported for samples of transistors taken from the production line for processing as improved reliability transistors. Further evaluation of thermal resistance measurement using the dc beta method with voltage compensation is described. These measurements are reported as being reproducible and correlate with measurements by the pulse V_{EB} method. On a group of 19 improved reliability transistors, the thermal resistance to case ranged from 0.18° C/mw to 0.25° C/mw, with a median value of 0.22° C/mw. Author

N64-12022 Army Missile Command, Huntsville, Ala. Redstone Scientific Information Center
SOME THEORETICAL PROBLEMS IN THE OPERATIONS OF A PHASEMETER ON ULTRA-HIGH FREQUENCIES
S. B. Rubin 14 Nov. 1963 24 p refs Transl. into ENGLISH from Radiotekh. i Elektron (Moscow), no. 1, 1961 p 125–136
(RSIC-98; AD-425377)

The operational precision of individual units of a serrodyne phasemeter on ultrahigh frequencies (UHF) is examined from a theoretical viewpoint. Taken into consideration are the influence of the instability of the frequency of a klystron generator, the imperfection of the characteristics of a serrodyne method of frequency shift, the presence of standing waves in the waveguide, and the imperfection of amplitude limiters and phase detectors on the occurrence of parasitic phase incidents in high- and low-frequency channels of a phasemeter. Author

N64-12047 Radio Corp. of America, Princeton, N.J. RCA Labs.
CRYOELECTRIC MEMORIES [Final Report, 1 Mar. 1962-28 Feb. 1963]
Leslie L. Burns, Jr., Richard W. Ahrons, David A. Christiansen, Louis S. Cosentino, Julius Fejer et al Griffiss AFB, N.Y. Rome Air Develop. Center Oct. 1963 271 p refs
(Contract AF 30(602)-2722)
(RADC TDR-63-351; AD-422950) OTS: $17.50

The report describes work on continuous evaporated-film cryoelectric-memory devices. It includes basic principles of superconductivity, followed by a detailed description of memory operation and a thermodynamic analysis. Considerable fabrication and constructional details are given on the design and building of the necessary test equipment. Detailed experimental results on 16-bit and 16,384-bit cryoelectric memory planes are given. Studies of the effects of impurities, film thickness, and other parameters are presented. Author

N64-12110 Autonetics, Anaheim, Calif.
MICROELECTRONICS AND MINUTEMAN Technical Paper
Richard C. Platzek Aug. 1963 32 p refs
(Publ. 550-A-79)

The incorporation of integrated circuits and new design techniques in the Improved MINUTEMAN guidance and control system illustrates a current application in the field of microelectronics. The increasing utilization of semiconductor integrated circuits will be largely responsible for achieving increased reliability, together with reductions in volume, weight, and power requirements. Author

N64-12188 Westinghouse Electric Corp., Baltimore, Md.
RESEARCH IN ADVANCED PHOTOELECTRIC INFORMATION STORAGE [Final Report, Jun. 1962-Jul. 1963]
W. G. Reininger, A. S. Jensen, and W. G. Beran Wright-Patterson AFB, Ohio, AF Avionics Lab. Nov. 1963 138 p refs
(Contract AF 33(657)-8715)
(Rept. 437 D; RTD-TDR-63-4134; AD-423982)

The state-of-the-art of the components of a tape camera storage tube, in which image information is written by photoelectrons magnetically focused as an electroncharge pattern on the storage tape, is reviewed. Improvements increased resolution from 40 to the present 75 line pairs/mm for small rasters at 5% response. Response curves have been measured showing 60 line pairs/mm at 10% response by using an 0.8-in. by 0.6-in. raster with a 100% contrast bar pattern. The hard-copy film photo of the display kinescope showed 23 line pairs/mm (retina dimension) resolution, 8 shades of gray resolvable by the eye, and a contrast of 80% when a scene with a maximum of 50% contrast is stored on a 0.7-in. square raster with an average exposure of 0.8 meter-candle-second on a 50-microampere/lumen S-20 photocathode and a read-off with a 0.1-microampere beam. Photodiodes were made to test the image section operation. An electronic shutter was developed which operates in the image section. A 1000-volt pulse operated this shutter for exposures as short as 100 microseconds. The diameter of the reading electron beam was reduced by a factor of two, whereas the total current was increased by a factor of twenty for a total increase in current density of eighty. Author

N64-12192 Air Force Cambridge Research Labs., Bedford, Mass.
TABULATION OF THE PROBABILITY OF DETECTION AND CORRECT DECISION AMONG M ALTERNATIVES FOR PHASE-INCOHERENT RECEPTION Research Report
D. Shnidman Sep. 1963 36 p refs
(AFCRL-63-374; AD-424731)

This paper is concerned with the investigation and tabulation of the function

$$P_{cM}(\rho, \lambda, \Gamma) = (1 - \lambda)e^{-\rho/2} \int_0^\infty ds \int_{\frac{\Gamma}{\sqrt{1-\lambda}}}^\infty dr\, s\, r\, e^{-(r^2+s^2)/2}$$

$$I_0[\sqrt{\rho(1-\lambda)}r]\, I_0(\sqrt{\lambda}\, rs) \times [1 - Q(\sqrt{\lambda}\, s, r)]^{M-1},$$

where I_0 is the zeroth order modified Bessel function of the first kind and

$$Q(\alpha, \beta) = \int_\beta^\infty dx\, x\, e^{-(x^2-\alpha^2)/2}\, I_0(\alpha x).$$

This function is tabulated for $\lambda = 0.0, 0.2, 0.4$; $\Gamma = 0.0(0.5)5.5$; $\rho = 0, 1, 4, 9, 16$ (25 and 32 for $\lambda = 0.0, 0.2$ only); and $M = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 16, 32, 64, 128, 256, 512$. $P_{cM}(\rho, \lambda, \Gamma)$ is the probability of detecting and correctly choosing one of M equiprobable signals with common cross-correlation coefficient λ, under optimum phase-incoherent reception, where Γ is the threshold level and ρ is the signal-to-noise ratio. Author

N64-12195 Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
AN ANALYTICAL AND EXPERIMENTAL STUDY OF THE IONIZED FLOW FIELD ABOUT A HEMISPHERE CYLINDER AND ITS EFFECT ON THE RADIATION PATTERN OF A SLOT ANTENNA Final Report
J. T. Curtis, A. F. Burke, and R. A. Hayman Aug. 1963 154 p refs
(Contract AF 19(604)-8494)
(AFCRL-63-339; AD-424093)

A combined analytical and experimental investigation of the effect of stagnation region chemical-ionization nonequilibrium phenomena on the aerothermodynamic and electrical properties of the flow field over a hemisphere cylinder at hypersonic speeds was conducted. Measurements were made of the surface pressure and heat transfer, shock layer pitot pressure, and surface layer electrical conductivity on hemisphere cylinder models for a range of values of the stagnation region nonequilibrium scaling parameter $\rho \propto r_b$. In addition, the radiation pattern in the equatorial plane from a slot antenna mounted in a 12-in.-diam. hemisphere cylinder was measured in the presence of the shock tunnel generated plasma layer. The data were correlated and compared with theoretical predictions. In most cases, the agreement between theory and experiment was found to be satisfactory. Author

N64-12207 Minneapolis-Honeywell Regulator Co., Boston, Mass.
DEVELOPMENT OF SELF-REPAIR PROCEDURES Final Report
William S. Jarnagin, John Flynn, Douglas Pitman and Kevin Fitzgerald Griffiss AFB, N.Y., Applied Res. Lab., Nov. 1963 80 p refs
(Contract AF 30(602)-2727)
(RADC-TDR-63-175)

The purpose of the program is to develop nonredundant self-repairing electronic circuitry which utilizes the natural behavior of the material constituting the circuitry. The approaches investigated included several metallic-whisker-growing mechanisms (the idea being to grow metallic whiskers across breaks in electronic circuitry and thus restore electrical continuity), and several post-solder coatings, such as silver epoxy, indium-gallium, conductive rubber, etc., (the idea being to add mechanical flexibility to a given circuit and to make possible a redistribution of material for spanning damaged regions). Author

N64-12211 Sperry Gyroscope Co., Great Neck, N.Y.
WIDE-BAND BEAM-TYPE PARAMETRIC AMPLIFIER
R. Eng, K. Knudsen, and W. Guth Griffiss AFB, N.Y., Electron. Warfare Lab. Nov. 1963 31p refs
(Contract AF 30(602)-3055)
(RADC-TDR-63-444; NA-8210-8364-1; AD-425001)

An X-band, beam-type parametric amplifier capable of operating in a 20-percent instantaneous band of frequency is under development. The device is a degenerate type with the pump frequency fixed at 21 Gc. The amplifier is to have an rf gain of 25 db and a double-channel noise figure of 2 db. The general problems and approaches to the solutions of the problems are discussed. The coupler to be used is a modified bifilar helix, and the pump is a resonant quandrupole type. Specific areas of discussion include the choices of beam and circuit parameters in connection with mode separation and selective excitation. The methods of generating a uniform magnetic field and a smooth electron beam are also discussed. Initial calculations and factual data are presented for the coupler, the coupler excitation circuit, the pump characteristics, and the rf matching problems. Author

N64-12220 Army Missile Command, Huntsville, Ala.
A SPECTRUM COMPRESSION RADAR TECHNIQUE Final Report
Wallace E. Wood, Harold B. Buie, Jr., Eugene J. Mc Manus, Jr., and Waite H. Todd 8 Aug. 1963 60 p refs
(RE-TR-63-23; AD-425675)

This report concerns an experimental program conducted for the purpose of investigating a particular cross-correlation signal processing technique, (spectrum compression) and to define characteristics of interest in potential applications to Army weapons systems. No significant discrepancies were found to exist between theory and the experimental results. The spectrum compression, cross-correlation technique possesses unique characteristics which make it particularly suitable to applications in radar, secure communications, command guidance links, and other weapon systems functions. A simplified method of calculating Fourier transforms of waveforms applicable to this cross-correlation technique is presented. Author

N64-12225 Battelle Memorial Inst., Columbus, Ohio
DESIGN CRITERIA FOR HIGH-SPEED POWER-TRANSMISSION SHAFTS. PART I. ANALYSIS OF CRITICAL SPEED EFFECTS AND DAMPER SUPPORT LOCATION [Final Report, May 1962-Jul. 1962]
R. G. Dubensky, C. C. Mellor, Jr., and J. E. Voorhees Wright-Patterson AFB, Ohio, Flight Accessories Lab., Jan. 1963 178 p refs
(Contract AF 33(616)-8290)
(G-4869; ASD-TDR-62-728; Pt. 1; AD-404848) OTS: $4.60

Repeated successful operation of high-speed power-transmission shafts at and far above their first critical speeds has been achieved. A basic new analytical technique for the design and analysis of high-speed shafting has been developed

using electrical transmission line theory. Limited experimental work has shown the technique to predict successfully the damper parameters necessary to high-speed shaft operation. Equations relating full-scale and model shaft configurations to produce similar dynamic behavior have been formulated. The experimental application of torque on high-speed shafting did not change lateral critical speed. This is not in agreement with theory, which predicts a decrease in critical speed. Damping coatings applied continuously along the length of high-speed shafts controlled vibration amplitudes to a slight degree at the lowest critical speeds. At higher order criticals the coatings had no desirable effects. Author

N64-12231 American Optical Co., Southbridge, Mass.
CHARACTERISTICS OF DIELECTRIC WAVEGUIDE MODES Final Report
Irmgard Luneburg and Ellas Snitzer Jul. 1963 478 p refs
(Contract AF 19(604)-7207)
(AFCRL-63-304; AD-424920)

A digital computer computation is made of the characteristics of cylindrical dielectric waveguide mode propagation for the 59 lowest order modes. The index of refraction of the cladding is taken as 1.52, and the computations are made for core indices of refraction of 1.53, 1.56, 1.62, 1.69, 1.75, 1.80, and 2.00. For a given mode and index combination, the region between cutoff and far from cutoff is covered by a computation of 40 points. At each point a computation is made for the phase velocity, group velocity, guide propagation constant, and the parameters needed to precisely describe the field in the core and cladding. Author

N64-12235 International Business Machines Corp., Owego, N.Y. Space Guidance Center
PULSED RADIATION EFFECTS ON AEROSPACE DIGITAL COMPUTERS [First Annual Report, 21 May 1962-21 May 1963]
Kirtland AFB, N. Mex., AF Weapons Lab., Oct. 1963 221 p refs
(Contract AF 29(601)-5399)
(RTD-TDR-63-3051; AD-423083)

Test objectives were to observe and analyze the behavior of components and circuits used in aerospace digital computers during short, high-intensity nuclear radiation pulses. Several types of burst sensors are compared, and the dosimetry for both the SPRF (Sandia Pulsed Reactor Facility) and flash X-ray radiation environments is discussed in detail. Considerable advancement was made in the development and application of computer programing techniques that permit automated digital-computer circuit analysis of the effects of pulsed nuclear radiation on typical aerospace digital computer circuits. Four of these computer programs are presented. Author

N64-12278 Emmanuel Coll., Boston, Mass. Research Language Center
FREQUENCY AND DURATION OF INDIVIDUAL FADINGS AT TROPOSPHERIC SCATTER INTERVALS [HAUFIGKEIT UND DAUER EINZELNER SCHWUNDEINBRUCHE BEI TROPOSPHARISCHEN SCATTERSTRECKEN]
J. Grosskopf and L. Fehlhaber Jan. 1963 34 p refs Transl. into ENGLISH of an article from NTZ-Nachtechn. Z. (Brunswick), no. 2, 1962 p 71-78
(Contract AF 19(604)-8505)
(E-T-R-G-63-4; AD-410793)

Investigations were conducted to determine the interference fading frequency and the fading duration distribution both for short-term intervals (up to one hour) and for long periods of time. The results of the investigations permit the complete calculation of short-term interval statistics when the position of the measuring level relative to the field strength median value and the mean fading frequency of the interval are known. A short-term distribution of fading durations was obtained from a series of measurements under conditions of scattering. With the aid of known long-term distribution of the hourly field strength median values under scattering and of a long-term distribution of the mean fading frequencies, it is possible to derive a long-term distribution of fading durations from their short-term distribution. The long-term distribution of the mean fading frequencies was obtained from observations over a single year at a 100-MHz interval. C.L.W.

N64-12286 Centro Di Studio Per La Fisica Delle Microonde, Florence (Italy)
ATMOSPHERIC DISPERSION AND ABSORPTION OF MICROWAVES Technical Report
O. Fagioli and G. Casini Apr. 1963 31 p refs
(Contract AF 61(052)-593)
(AFCRL-63-500; AD-424730)

Some methods are given for measuring the refractive index of gases at microwave frequency. A refractometer apparatus is described with two resonant cavities fed by a RF modulated klystron: one cavity is the reference for the stabilization of the klystron frequency over the first side band; the other one is tuned with the opposite side-band. Variations of refractive index are measured by means of the evaluation of the shift of the frequency of modulation, necessary to reset the second cavity into the original condition. Author

N64-12288 Air Force Cambridge Research Labs., Bedford, Mass.
PASSIVE AND TRANSFORMERLESS LC, RC, AND RL ONE-PORTS
Kurt H. Haase Oct. 1963 60 p refs
(AFCRL-63-506; AD-423616)

This report is concerned with the circuitry and the immittance functions of transformerless and canonical LC, RC, and RL one-ports implying 1, 2, 3, and 4 passive elements. It contains a complete compilation of all formulas necessary for: (1) circuit analysis; (2) circuit synthesis; and (3) circuit conversions between equivalent circuits. Author

N64-12317 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ARRANGEMENT OF AN ELECTRONIC RANGE FINDER TO MEASURE SMALL DISTANCES
1 May 1963 7 p Transl. into ENGLISH from Polish Patent No. 44375, (Class No. $21a^4$, 48/62, 27 Apr. 1961), 1961 1 p
(FTD-TT-62-1732/1+2; AD-408069)

An electronic range finder consisting of a main station and an auxiliary station is described. Distances up to 3 km can be measured to accuracies of $10^{-5} \pm 5$ cm. Measurement is based on measuring phase displacements of an exemplary electromagnetic wave propagating along a measured section. J.E.T.

N64-12347 Weapons Research Establishment (Australia)
TABLES OF WAVELENGTHS FOR CYLINDRICAL WAVEGUIDES AND FREE SPACE
J. R. Pyle Aug. 1963 121 p refs
(PAD-74)

Wavelengths for the dominant H_{11} mode in cylindrical waveguide have been computed for ten sizes of waveguide covering the frequency band from 3,500 Mc to 94,950 Mc. Tables of free space wavelength from an earlier technical note have been added. Author

N64-12354 Avco Corp., Wilmington, Mass. Research and Advanced Development Div.
RELIABILITY IN THE SPACE ENVIRONMENT
E. T. Maguire Jan. 1963 52 p refs
(*Its* Reliability Eng. Data Ser.)

An abstract and summary are presented of literature on the subject of space environments, with particular emphasis on the effects of the environment on the reliability of materials, components, and equipment contained in aerospace systems. The environment of space is discussed in the following areas: magnetic fields, gravitational fields, vacuum, micrometeorites, and radiation. R.T.K.

N64-12365 General Electric Co., Schenectady, N.Y.
SILICON PLANAR EPITAXIAL TRANSISTOR, TYPE 2N2193. SILICON GROWN DIFFUSED TRANSISTOR, TYPE 2N336. Fifth Quarterly Report, 30 Apr. 1963-31 Jul. 1963
F. J. Potter et al [1963] 55 p
(Contract DA-36-039-SC-86727)
(AD-423608)

Reliability measurements were conducted, and an inspection and quality-control plan was completed for the silicon planar epitaxial transistor, Type 2N2193. A production engineering measure program was conducted for the silicon-grown diffused transistor, Type 2N336, to improve production techniques. C.L.W.

N64-12368 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
A CAPACITANCE D-C GENERATOR OPERATING ON A NEW PRINCIPLE
A. A. Bal'chitis 27 Mar. 1963 19 p 2 refs Transl. into ENGLISH from Izvest. Vyssh. Ucheb. Zaved., Elektromekhan., no. 10, 1959 p 35-43
(FTD-TT-61-539/1+2; AD-401585) OTS: $1.60

The possibility of developing a capacitance high-voltage dc generator, without a commutator, based on the effect of current induction in the conductor circuit by the displacement of the electric field relative to the conductor circuit is discussed. A generator (different from ones presently known and based on the above principle) featuring simplicity of construction because of the absence of a commutator is described. P.V.E.

N64-12371 Massachusetts Inst. of Tech., Cambridge Research Lab. of Electronics
Quarterly Progress Report No. 71 [REVIEW OF RESEARCH ACTIVITIES IN RADIO PHYSICS, PLASMA DYNAMICS AND COMMUNICATIONS SCIENCES AND ENGINEERING]
H. J. Zimmermann and G. G. Harvey 15 Oct. 1963 314 p refs
(Contracts DA 36-039-SC-78108; AT(30-1)-1842; AF 19(604)-5992; AF 33(616)-7624; Grant DA-SIG-36-039-61-G14 et al)
(AD-424620)

Progress is reported in: (1) radio physics, including microwave spectroscopy, far-infrared spectroscopy, microwave electronics, radio astronomy, and physical acoustics; (2) plasma dynamics, including plasma physics, electronics, magnetohydrodynamics, and energy conversion; and (3) communications sciences and engineering, including statistical communications theory, speech communication, linguistics, and neurophysiology. J.E.T.

10 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands and wind tunnels); test ranges; and tracking stations. *For related information see* 06 Auxiliary Systems.

N64-11477 Federal Aviation Agency, Atlantic City, N.J. Systems Research and Development Service
IMPROVED TRACE (TAXIING AND ROUTING OF AIRCRAFT COORDINATION EQUIPMENT) DETECTORS Final Report
E. L. Reamer Jun. 1963 38 p

The techniques employed were: (1) a modified induction loop detector, (2) a modified CW Doppler detector (S-band), and (3) an FM/CW Doppler detector (X-band). Operational tests were conducted on each of the three types of detector units to determine their capabilities of detection and coverage patterns. Aircraft were taxied at various speeds through the detection fields, as well as flown at various altitudes in the approach zone of the runway, to determine the respective coverage patterns. In addition to gathering information on the reliability of each type of unit, tests were made to determine the effects of climatic variations and lightning discharges, and the susceptibility of the units to false triggering due to rain, foliage, and/or bird movements. Test results indicate that the FM/CW Doppler detection technique requires major modification to become suitable for use in a detection system. The CW Doppler detection technique and the induction loop detection technique are feasible. Author

N64-11594 Cutler-Hammer, Inc., Deer Park, N.Y. Airborne Instruments Lab.
EFFECTS OF WEATHER ON AIRPORT CAPACITY [Final Report]
F. B. Pogust and A. Kuprijanow Aug. 1963 95 p refs
(Contract FAA/ARDS-605)

On the basis of movement data for 681 days at Idlewild and aircraft spacing data from Idlewild and O'Hare Airports, the effects of various weather conditions on airport capacity were analyzed. The movement data were used to show how wind and ceiling visibility influence runway choice and the type of aircraft demanding service, which, in turn, affect airport capacity in relation to a weather factor. This factor, called the Ceiling Visibility Factor (CVF), was defined as the product of ceiling and visibility and, on the basis of available data, was plotted as a function of a percentage of calculated IFR capacity. An analysis of spacing data, taken on days when weather was a factor in aircraft operations, was used to identify a special arrival-spacing situation that occurs at large air-carrier airports when all large aircraft always use IFR separation. Author

N64-11622* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GROUND OPERATION EQUIPMENT FOR THE ORBITING ASTRONOMICAL OBSERVATORY
E. J. Habib, A. G. Ferris, H. W. Cooper (Westinghouse Elec. Corp., Baltimore), and R. L. Mc Conaughy (Grumman Aircraft Engineering Corp.) Washington, NASA Dec. 1963 24 p Presented at the Inst. of Aerospace Sci. Natl. Tracking and Command of Aerospace Vehicles Symp., San Francisco, 19 Feb. 1962
(NASA TN D-1856) OTS: $0.75

The Orbiting Astronomical Observatory (OAO) is a precisely stabilized satellite capable of being pointed to an accuracy of a fraction of a second of arc, and designed for a useful orbiting lifetime in excess of one year. The OAO will be controlled by ground operation equipment at remote control stations; this equipment will transmit operating commands which have been verified on an operational simulator that includes a large-scale digital computer. Suitable safeguards are incorporated to prevent irreversible commands from being transmitted to the satellite. An auxiliary realtime control mode is provided by connecting one remote control station by microwave link to a Central Control Station. The Central Control Station control and display equipment provides a quick-look capability for evaluating the spacecraft status by means of a printer and novel "index card"-type display system. Author

N64-11623 California U., Berkeley. Lawrence Radiation Lab.
MODIFICATIONS TO 88-INCH AND 184-INCH CYCLOTRONS: BIOLOGICAL RESEARCH FACILITIES
Robert L. Fulton, Lee R. Glasgow, and Nicholas W. Yanni 14 Nov. 1963 40 p ref
(Contract W-7405-eng-48)
(UCRL-11128)

Equipment at the 88-inch cyclotron includes a quadrupole magnet and various devices for beam monitoring, dosimetry, and subject alignment. Improvements to the medical cave at the 184-inch cyclotron include heavier shielding, hydraulic shielding door, 8-in.-diam. beam transport system, relocated control room, animal-rotator, and human-positioner translator. Author

N64-11640 Inter-Service Committee on Technical Facilities, Southeastern U.S.A.
DIGEST OF TECHNICAL FACILITIES AND CAPABILITIES
Harvard Eng et al Redstone Arsenal, Ala., Army Missile Command, Jan. 1963 393 p
(AD-406208)

Facilities and capabilities of the following are discussed: (1) U.S. Army Missile Command; (2) Tennessee Valley Authority; (3) U.S. Army Waterways Experiment Station; (4) U.S. Navy Mine Defense Laboratory; (5) U.S. Navy Underwater Sound Reference Laboratory; (6) University of Florida Engineering and Industrial Experiment Station; (7) Georgia Institute of Technology Engineering Experiment Station; and (8) Bureau of Commercial Fisheries Fishery Laboratory. I.v.L.

N64-11786 Joint Publications Research Service, Washington, D.C.
FUTURE SUPERSONIC TRANSPORT AIRCRAFT AND PRESENT AIRPORTS
Ion Iacovachi 5 Dec. 1963 32 p refs Transl. into ENGLISH of an article from Rev. Transporturilor (Bucharest), v. 10, no. 9, Sep. 1963 p 416–427
(JPRS-22142; OTS-63-41295) OTS: $1.00

The future of supersonic transport aircraft and their use of present airports are reviewed. The developmental state of present aeronautical technology will permit the realization of supersonic planes which can fly at about Mach 3 and can operate in the full stratosphere at heights of about 20,000 meters. Technicians are divided into two opposing groups from the point of view of the structure of the materials to be used in their constructions. One group advocates the use of a "cold" airplane built of light metal which will permit a Mach speed of 2.2. The second group advocates the use of "warm" airplane built of stainless steel and titanium and perhaps being capable of evolving progressively in operation up to Mach numbers of 2.5 to 3.5. A brief analysis of the aspects concerning the takeoff and landing of supersonic planes indicates that present-day airports open to international traffic and having runways between 1600 to 4500 meters could be used for passenger transport in the supersonic planes. It is estimated that 7 to 10 years will have to pass for supersonic passenger planes, destined primarily for the great air routes, to enter into actual operation. I.v.L.

N64-11890 Ling-Temco-Vought Co., Dallas, Tex. LTV Research Center
PLASMA ARC FACILITIES IN THE UNITED STATES
D. J. Tillian Nov. 1963 105 p refs
(Rept. No. 0-71000/3R-22)

The purpose of this report is to present a compilation of the operating plasma arc facilities in the United States. The information presented is the result of survey sheets sent to numerous organizations, personal discussions with the operators of various plasma arc tunnels, and literature search. Information obtained by this survey includes the type of facility, persons responsible for operating the facility, test equipment, testing capabilities, instrumentation, etc. The facilities appear in alphabetical order with the pertinent operating parameters which are common to plasma arc tunnels. I.v.L.

N64-11909 Advisory Group for Aeronautical Research and Development, Paris (France)
UNITED STATES NAVY PILOT-CONTROLLED LANDING PROCEDURE AND ASSOCIATED EQUIPMENT
J. H. Nelson and G. M. Griffin (Naval Air Test Center) Jan. 1963 20 p refs
(AGARD-423)

The constant glide-slope power approach to landing is defined as establishing the airplane in the desired landing condition early in the landing maneuver and maintaining this condition to touchdown. Reasons for the U.S. Navy adopting this procedure are advanced. The applicability of the procedure to noncarrier-based fixed-wing airplanes is discussed. Various optical and electronic devices, including an approach power compensator, which can aid the pilot in executing the discussed procedure, are fully described. The effectiveness of each device, integral or external to the airplane, in presenting airspeed, glide slope, lineup, bearing, and range information to the pilot under VFR and IFR conditions, is delineated. Author

N64-11910* Advisory Group for Aeronautical Research and Development, Paris (France)
THE USE OF PILOTED FLIGHT SIMULATORS IN TAKE-OFF AND LANDING RESEARCH
George E. Cooper (NASA, Ames Res. Center) Jan. 1963 37 p refs
(AGARD-430)

Several factors which affect significantly the validity of research results drawn from piloted simulators are discussed

in some detail. These include: control system characteristics, visual cues related to cockpit instruments and those related to the outside world, motion cues or distractions, selection of criteria and tasks, environmental and operational aspects, and fidelity of the analog simulation. Examples of the use of piloted simulators in landing research are presented and discussed with the purpose of illustrating and defining both their value and limitation with respect to those six items. Author

N64-11947 Hanford Atomic Products Operations, Richland, Wash.
REVIEW OF POWER AND HEAT REACTOR DESIGNS (DOMESTIC AND FOREIGN)
E. R. Appleby, comp. Oct. 1963 371 p refs
(Contract AT(45-1)-1350)
(HW-66666 REV 2) OTS: $4.50

An annotated bibliography is presented on the following: (1) aqueous homogeneous suspension and molten-salt homogeneous reactor; (2) boiling light-water reactors; (3) cavity reactors; (4) gas-cooled reactors; (5) heavy-water moderated reactors; (6) liquid-metal reactors; (7) organic moderated and/or cooled reactors; (8) pressurized light-water reactors; (9) steam-cooled reactors (10) systems for nuclear auxiliary power (SNAP); and (11) available information on proposals or projects for which no reactor type has been selected. R.T.K.

N64-11974 Joint Publications Research Service, Washington, D.C.
AN EXPERIMENTAL INSTALLATION FOR STUDYING THE VAPOR PRESSURE OF ALKALI METALS AT HIGH TEMPERATURES
E. E. Shpil'rayn and A. M. Zvereva *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 97-102 (See N64-11965 03-01) OTS: $3.50

A new experimental procedure is described for determining the vapor pressure of alkali metals at high temperatures. The advantages of this procedure in comparison with the boiling-point method are presented. The layout of the apparatus used is described. Author

N64-12103* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DESCRIPTION AND INITIAL CALIBRATION OF THE LANGLEY HOTSHOT TUNNEL WITH SOME REAL-GAS CHARTS FOR NITROGEN
Fred M. Smith, Edwin F. Harrison, and Pierce L. Lawing Washington, NASA, Dec. 1963 59 p refs
(NASA TN D-2023) OTS: $1.50

Development and initial calibration tests of the Langley hotshot tunnel have been completed, and results are presented. An arc-chamber temperature and pressure of approximately 3000° K and 10,000 psi produced a free-stream Mach number of approximately 20 in the test section. Comparisons of various configurations and materials for the arc-chamber components are presented along with contamination measurements. Flow contamination was significantly reduced by modification of the arc-chamber configuration. Some real-gas correction factors, which consider intermolecular forces and vibrational equilibrium effects for nitrogen flow in hypersonic nozzles, are also presented. Author

N64-12112 Los Alamos Scientific Lab., N. Mex.
RADIOACTIVE GASEOUS EFFLUENTS FROM A HOMOGENEOUS REACTOR
Dale E. Hankins 21 Nov. 1963 47 p refs
(Contract W-7405-eng-36)
(LAMS-2937) OTS: $1.00

This paper presents the radioactive isotopes and the concentration of these isotopes in the effluent gases released from the Water Boiler reactor stack. The effect of prior operation of the Water Boiler reactor on the relative concentrations of the various isotopes is discussed. An evaluation is made of the results of an additional delay in the stack line. The curie output through the stack for each major isotope following a normal reactor operating day is given. Author

N64-12154 Federal Aviation Agency, Atlantic City, N.J. National Aviation Facilities Experimental Center
EVALUATION OF INSET LIGHTING FIXTURES Final Report
T. H. Paprocki Oct. 1963 32 p ref

The evaluation effort involved an investigation of: (1) suitability of photometric characteristics; (2) abuse resulting from aircraft takeoff and landing operations; (3) effects of outdoor operation under all weather conditions; (4) possible damage resulting from the use of heavy equipment and snowplow blades along the runway; and (5) runway roughness. The results of the evaluation indicated that the Westinghouse fixture, with some modifications, would be satisfactory for use in touchdown zone lighting systems. Author

N64-12251 Norwegian Defence Research Establishment, Kjeller
THE ROCKET RANGE AT ANDØYA Technical Note No. 1
B. Landmark Jun. 1963 17 p
(Contract AF 61(052)-599)
(FFIT Intern. Rept. E-13; AFCRL-63-745; AD-422880)

A rocket range has been established at Andøya in Northern Norway. Nike-Cajun or equivalent rockets can be fired from a zero length launcher. A rather simple doppler method is used in order to measure the slant range to the vehicle as a function of time during the flight. The purpose of the present paper is to describe some of the most important facilities at the range, to outline the operational procedure, and to discuss the experience gained from the launchings of Ferdinand I, II, and III. Author

N64-12373 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
SECOND GENERAL CONFERENCE OF THE SIBERIAN BRANCH OF THE ACADEMY OF SCIENCES USSR
A. K. Chernenko 28 May 1963 7 p Transl. into ENGLISH of an article from Izv. Akad. Nauk SSSR, Sibinsk. Otd. (USSR), no. 12, 1958 p 93-94
(FTD-TT-63-237/1)

The sessions were devoted to evaluation of projects and plans for scientific research in Siberia. R.T.K.

N64-12385 R. Dixon Speas Associates, Manhasset, N.Y.
SUMMARY VOLUME-ATA DELAY DATA PROGRAM
R. D. Speas, M. H. Smith, A. C. Botsford, E. A. Cutrell, and D. S. Little Oct. 1963 51 p
(Contract FA-WA-4456)

This Volume presents a summary of the principal areas of delay experienced by airlines and airports in the United States. The program involved the collection of airline delay data during April and May 1963 and the subsequent machine processing and analysis of the information. The purpose of the study is to provide insight into and interpretation of the size and complexity of the airline delay problem and to form the basis for a recommended program of corrective action. Author

11 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; 13 Heat Transfer and Thermodynamics; and 24 Physics, Plasma.

N64-11555* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

BOUNDARY-LAYER VELOCITY PROFILES AND SKIN FRICTION DUE TO SURFACE ROUGHNESS ON AN OGIVE CYLINDER AT MACH NUMBERS OF 1.61 AND 2.01

K. R. Czarnecki and William J. Monta Washington, NASA, Dec. 1963 42 p refs
(NASA TN D-2048) OTS: $1.00

Nine types of two-dimensional fabrication-type surface roughness were investigated. The results indicated that the velocity profiles tended to agree with the 1/7- and 1/8-power velocity distributions. There was only a small effect of surface roughness on boundary-layer momentum losses. Thus, the tests confirm the previously-derived conclusion that surface roughness has little effect on skin friction, and that wave drag constitutes the major part of the drag of surface-roughness elements.
Author

N64-11653 Minnesota U., Minneapolis

MASS TRANSFER CHARACTERISTICS OF A VENTURI LIQUID-GAS CONTACTOR

W. G. Bauer, A. G. Fredrickson, and H. M. Tsuchiya Repr. from I&EC Process Design and Develop., v. 2, Jul. 1963 p 178–187 refs
(NASA Grant NsG-79-60)

Gas absorption by water in a Venturi gas-liquid contactor was studied. The contactor produces a fine dispersion of gas bubbles in liquid by pumping the liquid through the Venturi and introducing the gas at the throat. A carbon dioxide–water system was chosen for study. The water flow rates ranged from 5.0 to 20.0 gallons per minute with introduction of 0 to 10,300 cc/min. (0.364 ft^3) of carbon dioxide saturated with water vapor, yielding molar gas-liquid ratios of 0 to 1.23×10^{-4}. Radial and axial concentration profiles in the liquid phase were determined, as were axial pressure profiles in the Venturi. Effects of gas and liquid rates on absorption and overall pressure drop are presented graphically. Water flow rate through the Venturi was found to be the most significant factor affecting absorption. Application to gas-liquid contacting in microbial propagators is discussed.
Author

N64-11716 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

EFFECT OF RATE OF HEAT RELEASE IN ELECTRIC EXPLOSIONS IN WATER ON THE DISTRIBUTION OF THE EXPLOSION ENERGY

M. I. Vorotnikova *In its* J. of Appl. Mech. and Tech. Phys. Selected Articles 3 May 1963 p 57–62 refs Transl. into ENGLISH of an article from Zh. Prik. Mekhan. i Tekhn. Fiz. (Moscow), no. 2, 1962 (See N64-11711 03-01) OTS: $6.60

The energy distribution of an underwater electric explosion between the shock wave and the energy of radial motion of the layers of the medium adjacent to the gas bubble is investigated. Experiments indicated that the positive phase of the pressure wave, Δt_+, does not depend on the rate of energy release in the spark gap. The quantity Δt_+ is a function of the initial radius of the gas bubble. At given parameters of the discharge circuit, the energy of the pressure wave at a distance of 20 cm from the source amounts to only a few percent of the energy initially stored in the capacitor. The energy of radial motion of the liquid layers adjacent to the gas bubble amounts to about 22% of the energy initially stored in the capacitor and is independent of the initial rate of energy release.
P.V.E.

N64-11905* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

STABILITY OF FREE-CONVECTION BOUNDARY-LAYER FLOWS

Philip R. Nachtsheim Washington, NASA, Dec. 1963 41 p refs (NASA TN D-2089) OTS: $1.00

The stability of free-convection boundary-layer flows is investigated by numerical integration of the disturbance differential equations. Stability calculations are carried out for Prandtl numbers of 0.733 (air) and 6.7 (water), with and without temperature fluctuations. Results presented for these four cases consist of eigenvalues (phase velocity, wave number, and Reynolds number), eigenfunctions, and energy distribution curves for neutrally stable disturbances. Tabulations of the basic velocity and temperature profiles for a Prandtl number of 6.7 are also included. When temperature fluctuations are included, a mode of instability is found in which the primary source of energy for the disturbance motion arises from the interaction of buoyancy forces with velocity fluctuations. The present stability results are compared with available theoretical and experimental results.
Author

N64-11952 Deutsche Versuchsanstalt für Luft-und Raumfahrt, Freiburg (W. Germany) Inst. fur Angewandte Mathematik und Mechanik

CONTRIBUTION TO THE APPROXIMATION THEORY OF COMPRESSIBLE LAMINAR BOUNDARY LAYERS WITH HEAT TRANSFER [BEITRAG ZUR NAHERUNGSTHEORIE KOMPRESSIBLER LAMINARER GRENZSCHICHTEN MIT WARMEUBERGANG]

Alfred Walz Oct. 1963 82 p refs In GERMAN
(DVL-281)

An approximation theory for the compressible laminar boundary layer with heat transfer is developed. A suitable one-parametric velocity-profile class, for example, the Hartree profile, is assumed. Wall shearing stress and dissipation are deduced by constraint from the formulas for the velocity profile and from the temperature and velocity profiles. Analytical expressions are provided for the universal functions of the approximation theory on the basis of the Hartree profile. The wall absorptions derived from the Prandtl boundary-layer equation and from the partial differential equation for the temperature boundary layer are used to improve, by iteration, the calculation of the heat transfers for the case of large pressure and temperature gradients in the direction of flow. Using this theory, the following examples were examined: (1) flow along a flat plate with the calculation of the coefficient of friction as a function of the Mach number; (2) flow with a pressure gradient; and (3) flow on a flat plate, with a superimposed stationary sinusoidal perturbation velocity, for an incompressible and compressible medium with heat transfer.
I.v.L.

N64-11967 Joint Publications Research Service, Washington, D.C.

APPLICATION OF THE THERMODYNAMICS OF IRREVERSIBLE PROCESSES TO THE FLOW OF A MULTICOMPONENT LIQUID THROUGH POROUS MEDIA

R. G. Mokadam *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 12–26 refs (See N64-11965 03-01) OTS: $3.50

By means of the correct definition of a thermodynamic system consisting of a liquid and solid particles, it is established that entropy increase is due to thermal conductivity, diffusion, viscous flow, and movement of the center of gravity of the liquid phase in the presence of friction. General equations of motion are obtained on the basis of phenomenological equations derived in the course of the analysis. It is shown that the nature of nonisothermal flow with slip, or of molecular flow, is determined by the Joule–Thomson coefficient, and by the thermal conductivity of the liquid. Author

N64-11969 Joint Publications Research Service, Washington, D.C.

SINGULARITIES OF SUPERSONIC FLOWS IMMEDIATELY ADJACENT TO A TRANSONIC REGION

A. A. Gukhman, A. F. Gandel'sman, L. N. Naurits, and V. V. Usanov *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 35–47 refs (See N64-11965 03-01) OTS: $3.50

It is experimentally shown that the hydrodynamic theory of heat exchange in its conventional form is not immediately applicable to a transonic region. Substantiation for the hypothesis of the degeneration of turbulence in this region and of the substantial weakening of energy dissipation, with a simultaneous increase in heat-exchange intensity, connected with the degeneration is provided. P.V.E.

N64-11980 Joint Publications Research Service, Washington, D.C.

A STUDY OF THE UNIFORMITY OF MOTION OF A DISPERSION LAYER IN PARALLEL CHANNELS

Z. R. Gorbis and Yu. L. Tonkonogiy *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 163–173 refs (See N64-11965 03-01) OTS: $3.50

The conditions of heat and mass exchange and the reliable operation of installations which have multichannel apparatus are determined by the uniformity of distribution and motion of a layer of a free-flowing medium in the multichannel system. In this study, crushed, artificial graphite was used as the free-flowing material. The results of the study are presented. R.T.K.

N64-12014 Iowa State U. of Science and Tech., Ames Ames Lab.

DETERMINATION OF TURBULENT THERMAL DIFFUSIVITIES FOR FLOW OF LIQUIDS IN PIPES

William F. Beckwith (Ph.D. Thesis) and Ray Fahien Nov. 1963 132 p refs

(Contract W-7405-eng-82)

(IS-734) OTS: $2.50

Eddy thermal diffusivities as a function of radial position and Reynolds number have been determined for turbulent flow of water in a tube with a constant wall heat flux. The temperature and velocity profiles were measured, and the eddy thermal diffusivities were calculated by solving the energy balance equation using a seminumerical technique. Also, the eddy momentum diffusivities were determined so that analogies between heat and momentum transport could be tested. The eddy thermal and momentum diffusivities as a function of radial position were found to reach a maximum value at a position about midway between the center and the wall of the tube. The eddy thermal diffusivities were correlated with Reynolds number and radial position. The turbulent Prandtl number was found to vary with radial position from a value less than unity at the center to a value greater than unity at the wall. These results agree with previous mass transfer work and with theoretical models. A comparison of the thermal and momentum diffusivity results with mass diffusivity results indicates that molecular properties of the fluid have an important influence on the turbulent properties. Author

N64-12017* General Applied Science Labs., Inc., Westbury, N.Y.

GENERALIZED VISCOUS MULTICOMPONENT-MULTIPHASE FLOW WITH APPLICATION TO LAMINAR AND TURBULENT JETS OF HYDROGEN

Raymond Edelman and Harold Rosenbaum N.Y., Am. Inst. of Aeron. and Astronautics 1963 18 p refs Presented at the Heterogeneous Combust. Conf., Palm Beach, Fla., Dec. 11–13, 1963

(NASA Contract NAS8-2686)

(AIAA Paper 63-507) AIAA: $0.50 members, $1.00 nonmembers

The general conservation equations governing the behavior of the gases and condensed phases are derived. Viscosity heat conductivity, diffusion, and production of species by chemical reactions are included in the development. Nonequilibrium phenomena associated with the presence of condensed phases are discussed in some detail. Preliminary application to the high altitude hydrogen dumping process is made in an analysis and numerical calculation on a chemically frozen (diffusion controlled) axisymmetric jet in phase equilibrium. Author

N64-12037 Aerospace Corp., El Segundo, Calif. Systems Research and Planning Div.

ON THE NON-EQUILIBRIUM LOCALLY SIMILAR BOUNDARY LAYER WITH SCALING APPLICATIONS

R. H. Lee and E. S. Levinsky 21 Oct. 1963 36 p refs

(Contract AF 04(695)-169)

(TDR-169(3153-01)TN-7; BSD-TDR-63-160; AD-423099)

Solutions are presented for the laminar boundary-layer development on a flat plate with finite-rate oxygen dissociation by the method of local similarity. Comparison with the nonsimilar analyses of Chung and Anderson, and Blottner, for pure oxygen indicates good agreement for the atom and temperature profiles through the boundary layer, in the case of an adiabatic and noncatalytic wall. Binary scaling laws are demonstrated for application of these results to different altitudes, to the slender cone, and to the air mixture. The same principle can be used to construct approximate solutions, with strong pressure interaction from the solution with no interaction. Author

N64-12049 Minnesota U., Minneapolis

VISCOELASTIC SUPPORT DAMPING OF BUILT-IN CIRCULAR PLATES Technical Report [Jul. 1961–Jul. 1962]

T. J. Mentel and R. L. Schultz Wright-Patterson AFB, Ohio. AF Materials Lab., Oct. 1963 29 p refs

(Contract AF 33(657)-7453)

(ASD-TDR-63-648; AD-425013)

An experimental and theoretical study is conducted of the damping effectiveness of an inset of viscoelastic adhesive at the supports of built-in circular plates. The experimental study shows that a small inset of adhesive can increase the total cyclic energy loss in the fundamental flexural mode by about a factor of five for plates made of aluminum alloy. The theoretical study shows that an elementary model of the dissipated action demonstrates qualitatively all of the characteristics observed experimentally. Author

N64-12059 Aerospace Corp., El Segundo, Calif. Aerodynamics and Propulsion Research Lab.
HIGHLY NONEQUILIBRIUM BOUNDARY LAYER FLOWS OF A MULTICOMPONENT DISSOCIATED GAS MIXTURE
G. R. Inger 25 Oct. 1963 87 p refs
(Contract AF 04(695)-269)
(TDR-269(4230-10)-2; SSD-TDR-63-253; AD-424713)

Analytical solutions are presented for a family of highly nonequilibrium (nearly frozen) boundary-layer flows of a four-component dissociated gas mixture around nonablating bodies, with either a completely catalytic or perfectly noncatalytic surface. Both self-similar and locally nonsimilar flows are included. A detailed study of these solutions is given for a wide range of parametric conditions pertaining to either recombination-rate-controlled or dissociation-rate-controlled situations. The nonequilibrium boundary-layer behavior, including the sensitivity to the various chemical kinetic data and transport property parameters, is considered in detail for specific applications involving highly cooled stagnation point flows on blunt bodies, and hypersonic flows over sharp flat plates and slender cones. The accuracy of the local similarity approximation and use of nonequilibrium binary scaling laws are also examined for the plate and cone flows. Author

N64-12179 Aerospace Corp., El Segundo, Calif. Labs Div.
SMALL PERTURBATION THEORY FOR SHOCK TUBE ATTENUATION AND NON-UNIFORMITY
Harold Mirels and J. F. Mullen 30 Sep. 1963 64 p refs
(Contract AF 04(695)-169)
(TDR-169(3230-12)TN-8; SSD-TDR-63-223; AD-425008)
OTS: $6.60

Closed form expressions are derived, based on the concept of self similarity, for evaluating small perturbations of shock tube flow due to the wall boundary layer. Ideal diaphragm rupture is assumed. Extensive numerical results are obtained for the perturbations induced by the boundary layer in the driven gas, assuming that the boundary layer is wholly laminar or wholly turbulent. The driven gas is taken to be air. Various driver gases are considered. Numerical results are obtained for shock Mach numbers up to 20. It is shown that the effect of the driver gas boundary layer on perturbations in the driven gas is small for large diaphragm pressure ratios. The results indicate that a shock tube with an efficient driver, e.g., helium, should have less attenuation for a given shock Mach number than would an inefficient driver, e.g., air. The latter result disagrees with existing experimental data. The source of the discrepancy is not known. Author

N64-12204 Army Missile Command, Huntsville, Ala. Redstone Scientific Information Center
THE CALCULATION OF A THERMAL BOUNDARY LAYER IN THE FLOW OF A COMPRESSIBLE GAS
L. M. Zysina-Molozhen 10 Apr. 1963 14 p refs Transl. into ENGLISH from Inzhenerno-Fiz. Zhur. (Minsk), v. 5, no. 6, 1962 p 21-26
(RSIC-11; AD-404916)

A semiempirical approximation method is examined which permits calculation with adequate accuracy of the laminar, transient, and turbulent regions of a thermal boundary layer during flow of compressible gas over its surface. J.E.T.

N64-12239 Stevens Inst. of Tech., Hoboken, N.J. Davidson Lab.
VENTILATION INCEPTION ON A SURFACE-PIERCING DIHEDRAL HYDROFOIL WITH PLANE-FACE WEDGE SECTION
Gerard Fridsma Oct. 1963 30 p refs
(Contract Nonr 263(20))
(Rept. 952; AD-423951)

A surface-piercing, dihedral hydrofoil was tested to investigate the inception and extent of ventilation. The foil of wedge-shaped cross-section and dihedral angle of 30 degrees was shown to ventilate under a number of operating conditions when the speed, draft, and angle-of-attack were varied. Stable regions of fully attached and fully ventilated flow are defined by ventilation inception boundaries which are shown to depend on the speed and angle-of-attack and not on the depth of submergence. Expressions for the forces experienced by the foil under these stable flow conditions are derived and are shown to be in good agreement with the experimental results. Author

N64-12242 Wisconsin U., Madison Army Mathematics Res. Center
STABILITY OF FLOW OF A NON-NEWTONIAN LIQUID BETWEEN TWO ROTATING CYLINDERS IN THE PRESENCE OF A CIRCULAR MAGNETIC FIELD Technical Summary Report
M. N. L. Narasimhan Sep. 1963 32 p refs
(Contract DA-11-022-ORD-2059)
(MRC-433; AD-424951)

The fluid in question is assumed to be an incompressible Reiner-Rivlin fluid. The equations of motion for these non-Newtonian fluids governing marginal stability are derived, and boundary conditions for perfectly conducting cyclinders (Fermi boundary conditions) are formulated for the cases of corotating and counterrotating cylinders, when the gap between the cylinders, is small. The underlying characteristic value problem is solved by using an expansion in orthogonal functions method developed by Chandrasekhar to determine the critical Taylor numbers for marginal stability as stability criteria. Numerical calculations have been performed. It is found that the effect of cross-viscosity is to facilitate the onset of instability, whereas the effect of viscosity under similar conditions would be a stabilizing one. Thus the effect of cross-viscosity is found to be opposite to that of viscosity in the stability analysis of the present case. Author

N64-12247 Wisconsin U., Madison Army Mathematics Res. Center
ON THE THEORY OF LOCALLY ISOTROPIC TURBULENCE Technical Summary Report
P. C. Jain Aug. 1963 34 p refs
(Contract DA-11-022-ORD-2059)
(MRC-416; AD-424679)

Kolmogorov's modified hypotheses (1962) have been used to discuss three problems of locally isotropic turbulent medium. Expressions for the structure function and the spectrum function of the velocity field were obtained in the first section. The energy dissipation field was discussed, and expressions for the correlation function of the fluctuations of the energy dissipation and its spectrum were calculated. Finally, the correlation function of the induced current density and the magnetic field fluctuation spectrum for turbulent flow of a weakly conducting fluid were considered. Author

N64-12253 Avco-Everett Research Lab., Everett, Mass.
THEORY OF END WALL HEAT TRANSFER IN A MONATOMIC GAS, INCLUDING IONIZATION EFFECTS
J. A. Fay and N. H. Kemp Mar. 1963 30 p refs
(Contract AF 04(694)-33)
(Avco-Everett Res. Rept. 166; BSD-TDR-63-47; AD-425461)

This paper deals with the calculation of the convective heat transfer rate to the end wall of a shock tube from a monatomic gas heated by a reflected shock. A range of shock strengths is considered for which the equilibrium thermodynamic state is one of appreciable ionization. The resulting

boundary-layer problem involves the thermal conductivity and ambipolar diffusion coefficient for a partially ionized monatomic gas. The formulation here is restricted to the case of a catalytic wall and equal temperatures for all species. The effect of the plasma sheath at the wall is ignored. Consideration is given to three limiting cases for which similarity-type solutions of the boundary-layer equations may be found: (1) complete thermodynamic equilibrium behind the reflected shock and within the boundary layer; (2) equilibrium behind the reflected shock, but no gas-phase recombination in the boundary layer; (3) no ionization in either region. Author

N64-12259 Naval Ordnance Lab., White Oak, Md.
A SEMI-EMPIRICAL DERIVATION OF FRICTION, HEAT-TRANSFER, AND MASS-TRANSFER COEFFICIENTS FOR THE CONSTANT PROPERTY TURBULENT BOUNDARY LAYER ON A FLAT PLATE
Nael Tetervin Oct. 1963 65 p refs
(NOL-TR-63-77; AD-422359)

The friction coefficient and velocity profile are calculated from the relation between the shear, the sum of the molecular and eddy viscosity, and the velocity gradient. The nondimensional shear distribution is assumed to be fixed. The eddy viscosity across the boundary layer is obtained by joining a distribution for the wall region to one for the outer region. By use of the shear and eddy viscosity distributions, the velocity profile is calculated from the wall to the outer edge of the outer edge of the boundary layer for all Reynolds numbers without using the concept of laminar sublayer, transition region, logarithmic region, etc. The heat and mass transfer coefficients and the temperature and concentration profiles are calculated by a similar method. Author

N64-12272 General Electric Co., Philadelphia, Pa.
A MODEL FOR THE TRANSITION REGIME IN HYPERSONIC RAREFIED GAS DYNAMICS
B. B. Hamel 11 Nov. 1963 54 p refs
(Contract AF 04(694)-222)
(Doc. 63SD911; AD-424157)

A new, two-fluid model for the hypervelocity rarefied regime is presented. Those particles reflected from the surface of the body are considered as the "wall" fluid while all scattered and free-stream particles comprise the "cold" fluid; the assumption being that collisions between wall and cold particles convert wall particles to cold particles. To obtain expressions for the absorption and emission terms in the model, the distribution function of each fluid is represented by an expansion in the derivatives of the delta function, and the relevant integrations are performed. A moment method is developed for this regime. For the wall fluid, the free molecular distribution function with the number density is employed as state-variable for the wall fluid. For the cold fluid, the distribution function is expressed as an expansion in the higher derivatives of the delta function, the expansion parameter being the "Mach number" of the cold fluid. The resulting moment equations give a hydrodynamic description of the cold fluid, and a differential equation for the attenuation of the wall fluid number density. These equations are analyzed for the case of one-dimensional hypersonic compression (piston problem), and numerical results are presented. Author

N64-12282 American Meteorological Society, Boston, Mass.
THE TWO-DIMENSIONAL LAMB PROBLEM FOR AN INFINITE ELASTIC LAYER BOUNDED BY PARALLEL PLANES [DVUKHMERNAIA ZADACHA LEMBA DLIA BESKONECHNOGO UPRUGOGO SLOIA, OGRANICHENNOGO PARALLEL'NYMI PLOSKOSTIAMI]
G. Petrashen' Aug. 1963 9 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSSR (Moscow), v. 64, no. 6, 1949 p 783–786
(Contract AF 19(604)-6113)
(AD-421986)

The distribution of waves, u(x,z,t), in an elastic layer which can be excited by a single boundary effect concentrated in space and time is elucidated. The method of partial separation of variables is used to solve the problem and to obtain certain physical effects. Results of the investigation indicate that it can easily be proved that discontinuities of u_λ (field u_λ describes the distribution of repeatedly reflected longitudinal and transverse waves) can only be discontinuities of longitudinal and transverse space waves. Quantitative evaluations of a perturbation can be obtained for the vicinities of these wave fronts, and qualitative conclusions can be drawn for a perturbation at all other points of the layer. P.V.E.

N64-12291 Massachusetts Inst. of Tech., Cambridge Fuels Research Lab.
TURBULENT DISPERSION IN A PIPE FLOW Final Report
H. A. Becker, R. E. Rosensweig, and J. R. Gwozdz Sep. 1963 62 p refs
(Contract AF 19(604)-6181)
(AFCRL-63-727; AD-423938)

Turbulent diffusion from a point source in a pipe flow has been studied. The scattered-light technique was used to map the fields of point-concentration fluctuations and of the mean concentration in the diffusion plume. The relative intensity of the point-concentration fluctuations was found to be of the order of 100% on the plume axis and increased towards the plume edges. The parameters in Taylor's theory were evaluated; the intensity of fluctuations in the radial component of the velocity of a diffusing particle was estimated to be 2.84% of the centerline velocity in the pipe, and the Lagrangian (spatial) integral scale was found to be of the magnitude of 8.3% of the pipe radius. The value resulting for the turbulent Peclet number (the product of pipe diameter times centerline velocity divided by turbulent diffusivity) is 852. The use of sheet-illumination in the scattered-light technique facilitated the measurement of fluctuations in the integral concentration of material in a plume cross-section. Author

N64-12302 ARO, Inc., Arnold Air Force Station, Tenn.
PRESSURE FLUCTUATIONS RESULTING FROM AN ALTERNATING FLOW SEPARATION AND ATTACHMENT AT TRANSONIC SPEEDS
H. L. Chevalier and J. E. Robertson Arnold Eng. Develop. Cen ter Nov. 1963 49 p refs
(Contract AF 40(600)-1000)
(AEDC-TDR-63-204; AD-423095)

Investigations of unsteady pressures on cone-cylinder bodies at transonic Mach numbers were conducted in the Propulsion Wind Tunnel Facility (PWT). Static and unsteady pressure measurements were obtained for cone-cylinder bodies with cone half angles of 15, 20, 25, and 30 deg to determine characteristics of the various unsteady flow phenomena. This report presents a detailed analysis of the alternating separation and attachment flow phenomenon that occurs at the shoulder of the cone-cylinder. Results of this analysis indicate that from the static pressure distributions, the regions of the model to be subjected to unsteady loads, the free-stream Mach number at which this will occur, and the peak-to-peak and root mean square amplitude of these loads may be determined. The magnitude of the pressure fluctuations ranges from 0 to 43 percent

of the free-stream dynamic pressure, depending on cone angle, angle-of-attack, and position on the model surface, which correlates with predicted magnitudes from static pressure measurements. Author

N64-12322 Massachusetts Inst. of Tech., Cambridge
RESEARCH ON BOUNDARY CONDITIONS OVER THE TOOL-METAL INTERFACE IN PLASTIC-WORKING CONDITIONS
Final Report
D. Lee, T. Sata, and W. A. Backofen Jun. 1963 50 p refs
(Contract DA-19-020-ORD-4916)
(WAL-TR-620.5/11(F); AD-409167)

Conditions governing the deterioration of the lubricant film at a tool–metal interface were examined in the plastic compression of aluminum with different combinations of loading method, specimen design, and lubricant. In all cases, a peripheral lubricant failure occurred whenever tools overlapped the specimen. The initiation of a sticking zone occurred with a critical reduction of height; both the magnitude of the reduction and the subsequent growth of the zone were influenced by the nature of lubricant, but not by specimen shape or size. The effective deformation resistance in compression may be lowered under a cyclic loading schedule. The basis of the lowering is decreased friction in the tool-specimen interface. Author

12 GEOPHYSICS

Includes auroral phenomena; upper atmosphere studies; oceanography; cartography; geodesy; and geomagnetism. *For Van Allen belts see*: 28 Space Radiation. *For related information see*: 05 Astronomy and Astrophysics; 21 Meteorology; and 29 Space Sciences.

N64-11447 Aerospace Information Div., Library of Congress, Washington, D.C.
PHENOMENA IN THE UPPER ATMOSPHERE, COMPILATION OF ABSTRACTS FROM SOVIET LITERATURE
24 Oct. 1963 21 p refs
(AID-P-63-116; AD-423927, AID Work Assignment No. 3, Rept. 38) OTS: $2.60 ph, $0.83 mf

Abstracts presented cover the following topics: (1) solar radiation and the ionosphere; (2) Van Allen belts and cosmic rays; (3) satellite and missile data; and (4) the meteorology of the upper atmosphere. I.v.L.

N64-11451 Norwegian Defence Research Establishment, Kjeller
EXPERIMENTAL STUDIES OF THE ARCTIC D-REGION
Annual Summary Report
B. Landmark Jun. 1963 25 p refs
(Contract AF 61(052)-599)
(AFCRL-63-748; AD-422881)

This report describes results obtained so far from a project concerned with experimental studies of the arctic D-region by means of sounding rockets and ground based observations. Three rockets have been fired from a range that has been established at Andøya in northern Norway. A brief description of the main facilities at the range and of the method that has been used for trajectory observations is also included. Author

N64-11467 Saint Louis U., Mo. Inst. of Technology
SEISMIC WAVES GENERATED BY CHEMICAL EXPLOSIONS
Final Report [1 Aug. 1960-31 Jul. 1963]
Carl Kisslinger, Emil J. Mateker, Jr., and Thomas V. Mc Evilly
31 Jul. 1963 179 p refs
(Contract AF 19(604)-7402; ARPA Order 180-61, Amend. 2 (AFCRL-63-701; AD 423980)

In the course of this program, seismograms from some 160 small charges, one 500-pound surface burst, one 100-ton surface charge, and a buried charge of 10 tons were recorded at close range. The principal subjects investigated were: (1) the properties of the source functions obtained by phase equalization of dispersed surface waves recorded at close range; (2) the effect on surface waves of distributing the charge in space and time; (3) the effect of source depth on the properties of the compressional and the Rayleigh waves; (4) the effect of the medium at the shot on the properties of the seismic signal; and (5) the properties of the horizontally polarized shear waves generated by an explosion. I.v.L.

N64-11485 Joint Publications Research Service, Washington, D.C.
MEASURING THE COMPONENTS OF THE EARTH'S GEOMAGNETIC FIELD BY THE PROTON RESONANCE METHOD
V. D. Lomanyy, A. G. Prokof'yev, and B. M. Yanovskiy *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 1–11 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 3–15 (See N64-11484 03-01) OTS: $2.75

The theory, instrumentation, and results of measuring the geomagnetic field by the proton resonance method are presented. The magnetic induction of free nuclei in a medium such as water, wherein no preferred orientation of the protons exists initially, is discussed. A magnetometer operating on this principle is described which consists essentially of two Helmholtz coils wound on a tube containing distilled water, with the electronic equipment for measuring the precession frequency. This apparatus is used to measure the Z (vertical) component of the geomagnetic field by canceling out the H (horizontal) component as a result of setting the axis of the Helmholtz coils in the plane of the magnetic meridian and in the horizontal plane. Analysis of the recordings indicates that such a magnetometer is capable of measuring the geomagnetic field to one part in 10^{-5} and thereby represents a great improvement over conventional magnetometers. M.P.G.

N64-11486 Joint Publications Research Service, Washington, D.C.
USING NATURAL ELECTROMAGNETIC VARIATIONS FOR INVESTIGATION OF THE EARTH'S UPPER LAYERS
M. N. Berdichevskiy, B. Ye. Bryunelli, A. Ye. Lantsov, and O. M. Raspopov *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 12–17 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk. (Leningrad), v. 303, no. 13, 1962 p 49–55 (See N64-11484 03-01) OTS: $2.75

Studies of the upper layers of the earth's crust, using two magnetotelluric survey methods, are reported. Magnetotelluric profiling (MTP), which consists of recording, at one point only, the short period variations in both the geoelectric field and the horizontal components of the geomagnetic field, was used in studies of the Druskininkag–Prenay–Sovetsk profile in the Polish–Lithuanian depression. This area represents a major trough in the crystalline basement filled with sediments of the Paleozoic age including Permian gypsum beds of high magnetic resistance. Magnetovariation surveying (MVS) of the same area was also conducted. The methods of processing the results of both surveys are presented, and a relief profile of the area is obtained which agrees with data from seismic surveys. An evaluation of the two methods is presented which suggests that

the MTP method is of greater practical interest but that the MVS method may be especially valuable in permafrost regions, since this method is relatively insensitive to insulating horizons.
M.P.G.

N64-11487 Joint Publications Research Service, Washington, D.C.
PLOTTING MAGNETOTELLURIC SOUNDING CURVES ACCORDING TO RECORDINGS OF SHORT-PERIOD VARIATIONS IN THE NATURAL GEOMAGNETIC FIELD
A. V Kovtun *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 18–26 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 56–66 (See N64-11484 03-01) OTS: $2.75

The theoretical basis of magnetotelluric sounding (MTS) is presented, and the isolation of particular frequencies from short-period variation recordings for construction of MTS curves is discussed. A number of conditions are derived which must be satisfied in order to obtain reliable curves. These conditions include: (1) The amplitude- and phase-response curves of the instruments recording E and H components must be carefully analyzed. (2) Calibrations must be made using pulse trains rather than square waves. (3) The visible-amplitude method may be used provided allowance is made for all distortions that may be introduced by transient effects. (4) Waves of $T > 100$ sec are best analyzed using short pulse trains of high amplitude, employing Fourier integrals to simplify the calculations.
M.P.G.

N64-11491 Joint Publications Research Service, Washington, D.C.
DIRECTIONAL ELECTROMAGNETIC SOUNDING
G. V. Molochnov *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 75–84 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 118–128 (See N64-11484 03-01) OTS: $2.75

Directional equipment for induction measurement of high-conductivity structures covered by low-conductivity rocks is described. Essentially, the apparatus consists of a source coil through which an alternating current is passed and a receiving coil which is set up within or near the source coil. The apparatus can be operated at any suitable frequency provided the two coils are mutually perpendicular (thereby eliminating the primary or background field effects). The signal from the receiving coil is amplified and fed to a meter or recorder which is calibrated directly in field strength. The presence of a nearby conductor can be detected by rotating the coils about a horizontal axis in various azimuths until the maximum reading is obtained. The direction is more precisely determined from the points of silence, and the depth is determined from the maximum reading. When the receiver and the generator are contained in a single compact case, the phase as well as the amplitude can be measured for more accurate results. In addition, the measurements can be made underground, from aircraft, and from moving land vehicles.
M.P.G.

N64-11494 Joint Publications Research Service, Washington, D.C.
THE USE OF LOW-FREQUENCY ALTERNATING CURRENT IN ELECTRICAL PROFILING AND SOUNDING
Yu. I. Bulgakov and A. V. Veshev *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 106–111 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 187–192 (See N64-11484 03-01) OTS: $2.75

Results of d.c. and a.c. (dipole) methods in electrical profiling of areas where industrial or ore body interferences exist are compared. These results show that the line lengths usual in ore-bearing regions give virtually the same specific resistances (P_k) at 20 c/s using either method; therefore, the relationships used in d.c. computations can be used in a.c. interpretations. The low-frequency a.c. method was found to be more rapid while retaining the same accuracy as the d.c. methods; the a.c. apparatus was considerably lighter in weight, and measurements could be made in the presence of stronger interferences.
M.P.G.

N64-11496 Joint Publications Research Service, Washington, D.C.
INFLUENCE OF THE EARTH-AIR BOUNDARY ON THE ELECTRICAL FIELD OF A POLARIZED SPHERE
G. A. Tarasov *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 124–126 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 222–225 (See N64-11484 03-01) OTS: $2.75

The magnitude of the effect of the air–ground boundary on the electrical field of a vertically polarized and ideally conducting sphere at a given depth below the surface is considered. Calculations and graphical solutions are presented which show that the electrical field is given within 5% by the zeroth approximation if the depth of the center of the sphere is more than twice the radius, and within 1% if the depth is more than three times the radius. For depths less than twice the radius, a correction for the first, and sometimes second, reflection must be made.
M.P.G.

N64-11497 Joint Publications Research Service, Washington, D.C.
LOW-FREQUENCY NCHMU EQUIPMENT FOR PROSPECTING
D. R. Barkhatov *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 127–129 Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 241–244 (See N64-11484 03-01) OTS: $2.75

An apparatus designed for electrical prospecting at low frequencies is described and block diagramed. The apparatus measures potential differences, which can be reduced to apparent specific resistances if necessary. The complete equipment consists of a generator, a converter, and a vacuum-tube millivoltmeter. It has been used mainly for mean-gradient measurements with good reproducibility and highly detailed results, but it can also be used for profiling and sounding with dipole systems over short distances.
M.P.G.

N64-11499 Joint Publications Research Service, Washington, D.C.
PLOTTING WAVE-FRONT CHARTS WITH AN ARBITRARY LOW OF CHANGE IN SEISMIC VELOCITY WITH DEPTH
Yu. Ye. Nekrasov *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 138–146 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 292–300 (See N64-11484 03-01) OTS: $2.75

A method of interpreting seismic observations in a case where the distribution of the seismic velocity in the section is too complicated for the application of usual mean-velocity or analytic methods is presented. The arbitrary method proposed

can be used for any graphically specified law of variation; it consists of approximate calculation of the integrals

$$x = \int_0^z \frac{\alpha v(z)}{\sqrt{1 - \alpha^2 v^2(z)}}\, dz, \qquad (1)$$

$$t = \int_0^z \frac{dz}{v(z)\sqrt{1 - \alpha^2 v^2(z)}}. \qquad (2)$$

and construction of the rays using the accessory function

$$F_1(v) = \frac{\alpha v}{\sqrt{1 - \alpha^2 v^2}}.$$

Tables of v(z) are presented for construction of $F_1(v)$ and $F_2(v)$ and also for constructing curves of $F_1(z)$ after appropriate computations. M.P.G.

N64-11617 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM STUDIA GEOPHYSICA ET GEODAETICA (ELECTROMAGNETICS) [PRAGUE] VOL. 6, NO. 4, 1962
Jiri Mrazek et al 7 Mar. 1963 39 p refs Transl. into ENGLISH of 3 articles p 369–399
(JPRS-18010; OTS-63-21273) OTS: $1.00

CONTENTS:

1. PROPAGATION OF ULTRALONG ELECTROMAGNETIC WAVES IN THE MAGNETOSPHERE J. Mrayek p 1–7 refs (See N64-11618 03-12)
2. THE ORIGIN OF THE EARTH'S MAGNETISM N. V. Karpen p 8–25 refs (See N64-11619 03-12)
3. IONIZATION THROUGH EARTH SATELLITES L. Triskova p 27–36 refs (See N64-11620 03-12)

N64-11618 Joint Publications Research Service, Washington, D.C.
PROPAGATION OF ULTRALONG ELECTROMAGNETIC WAVES IN THE MAGNETOSPHERE
Jiri Mrazek *In its* Transl. from Studia Geophys. Geodaet. (Electromagnetics) [Prague] v. 6, no. 4, 1962 7 Mar. 1963 p1–7 refs (See N64-11617 03-12) OTS: $1.00

A discussion is presented of findings which were determined from an analysis of the rules of propagation of electromagnetic waves with acoustic frequencies in the magnetosphere. It is indicated that the solutions to some of the problems of the propagation of electromagnetic waves in the magnetosphere lead to mathematically complicated formulations which do not permit the use of algebraic solution, so that their numerical solution is possible only through high-capacity electronic computers. P.V.E.

N64-11619 Joint Publications Research Service, Washington, D.C.
THE ORIGIN OF THE EARTH'S MAGNETISM
N. Vasilesco Karpen *In its* Transl. from Studia Geophys. Geodaet. (Electromagnetics) [Prague] v. 6, no. 4, 1962 7 Mar. 1963 p 8–25 (See N64-11617 03-12) OTS: $1.00

An attempt to theoretically elucidate the origin and manifestations of the internal geomagnetic field is discussed. A theory of geomagnetism is presented which explains: (1) the existence of the terrestrial magnetic field; (2) the quasi-constancy of the intensity of this field; (3) the inclination of the magnetic axis from the geographic axis of the earth; (4) the displacement toward the West of the terrestrial magnetic field; and (5) the secular variation of the terrestrial magnetic field. The theory is based on two hypotheses which assume: (1) the existence, far back in time, of a magnetic field H of exterior origin that produced Foucault currents in the core while traversing the earth in rotation; the mechanical couple produced by these currents retarded the speed of the core by establishing a relative speed ω_0' between core and crust and by inclining the axis of the core from the axis of the earth through imparting to it a gyroscopic precession Ω' around the axis of the earth; and (2) the existence of an apparently neutral charge $+q_n$ distributed over the surface of the core and of the adjacent spherical surfaces, and of a charge $-q_n$ distributed over the surface of the crust and the adjacent surfaces. P.V.E.

N64-11620 Joint Publications Research Service, Washington, D.C.
IONIZATION THROUGH EARTH SATELLITES
Ludmila Triskova *In its* Transl. from Studia Geophys. Geodaet. (Electromagnetics) [Prague] v. 6, no. 4, 1962 7 Mar. 1963 p27–36 refs (See N64-11617 03-12) OTS: $1.00

From the theory developed in this paper and from measurements made of satellite signals, it is concluded that a satellite causes an increase of ionization in the vicinity of its path of travel. An analysis of the signals confirms the existence of an ionized formation ahead of the satellite. After consideration of the ionization mechanism involved, it is concluded that the concentration of the ionization formation is dependent on the cross section of the satellite, on its speed, and on the composition of the atmosphere at the altitude of the flight. An ionization mechanism is described which can be applied to satellites at altitudes up to 350 km. P.V.E.

N64-11638 National Committee for the International Geophysical Coordination, Science Council of Japan, Tokyo
JAPANESE CONTRIBUTION TO THE INTERNATIONAL GEOPHYSICAL YEAR AND THE INTERNATIONAL GEOPHYSICAL COOPERATION. VOL. V, MARCH 1963, XI.(a): ROCKETS
K. Maeda [1963] 15 p refs

Japanese contributions to the IGY and IGC include the following: (1) measurements of the temperature and wind velocity of the upper atmosphere during 1960 and 1961; and (2) the electron-density distribution, the electron-temperature distribution, and the ion-density distribution of the ionosphere on various days during 1961. I.v.L.

N64-11657* National Aeronautics and Space Administration, Washington, D.C.
GEOMAGNETIC DISTURBANCES. COLLECTION OF ARTICLES [GEOMAGNITNYYE VOZMUSHCHENIYA. SBORNIK STATEY]
Yu. D. Kalinin, ed. Dec. 1963 69 p refs Transl. into ENGLISH from IGY Program, Sect. 3, no. 4, 1960, Acad. of Sci., USSR (NASA TT F-105) OTS: $1.75

CONTENTS:

1. VERY LARGE AND LARGE GEOMAGNETIC STORMS AND SOME PROBLEMS IN THEIR THEORY V. I. Afanas'yeva and Yu. D. Kalinin p 1–14 refs (See N64-11658 03-12)
2. ANALYSIS OF LATITUDINAL VARIATIONS IN THE YEARLY COURSE OF MAGNETIC ACTIVITY M. Mishin, N. A. Mishina, and G. P. Kalinoskaya p 15–25 refs (See N64-11659 03-12)
3. SYNOPTIC CHARTS OF MAGNETIC DISTURBANCE IN THE ARCTIC A. I. Ol' p 26–35 refs (See N64-11660 03-12)

4. SOME PECULIARITIES OF VARIATIONS IN THE VERTICAL COMPONENT OF THE MAGNETIC FIELD OF THE EARTH IN THE ARCTIC OCEAN L. N. Zhigalov p 36–42 refs (See N64-11661 03-12)

5. ON THE NATURE OF THE COASTAL EFFECT Ye. A. Ponomarev p 43–52 refs (See N64-11662 03-12)

6. STATIONARY MICROVARIATION STATION WITH PHOTOELECTRONIC AMPLIFICATION N. V. Lipskaya, N. A. Deniskin, Yu. M. Yegorov, and V. F. Shel'ting p 53–60 refs (See N64-11663 03-13)

7. SECULAR VARIATIONS OF THE GEOMAGNETIC FIELD OF THE EAST ANTARCTIC S. M. Mansurov p 61–66 refs (See N64-11664 03-12)

N64-11658* National Aeronautics and Space Administration, Washington, D.C.

VERY LARGE AND LARGE GEOMAGNETIC STORMS AND SOME PROBLEMS IN THEIR THEORY

V. I. Afanas'yeva and Yu. D. Kalinin *In its* Geomagnetic Disturbances Dec. 1963 p 1–14 refs (See N64-11657 03-12) OTS: $1.75

A number of questions on the theory of geomagnetic storms has been considered, using the catalogs of geomagnetic storms for 1878 to 1959 as a basis. Besides the well-known cycle (11-year) variations, 30-year variations of moderate storms have been detected. In the 11-year cycle, the displacement of the storm number maximum, relative to the sunspot maximum and the sunspot zone displacement along the latitude, is connected with time variations in the density of the interplanetary medium: Corpuscular streams cause turbulence in the interplanetary medium, and the storm field (which is to a considerable extent an interplanetary magnetic field) is a thousand times intensified by turbulent movement caused by the stream. Author

N64-11659* National Aeronautics and Space Administration, Washington, D.C.

ANALYSIS OF LATITUDINAL VARIATIONS IN THE YEARLY COURSE OF MAGNETIC ACTIVITY

V. M. Mishin, N. A. Mishina, and G. P. Kalinoskaya *In its* Geomagnetic Disturbances Dec. 1963 p 15–25 refs (See N64-11657 03-12) OTS: $1.75

The main regularities of annual variations of magnetic activity obtained from the data of 1955 to 1956 are analogous to those obtained from the II IGY and IPY materials. In the polar region, the average level of activity varies several times with the transition from local winter to local summer. According to the data on the second harmonic of the annual activity variations, the angular width of the corpuscular radiation cone is about 90°. Author

N64-11660* National Aeronautics and Space Administration, Washington, D.C.

SYNOPTIC CHARTS OF MAGNETIC DISTURBANCE IN THE ARCTIC

A. I. Oi *In its* Geomagnetic Disturbances Dec. 1963 p 26–35 refs Transl. into ENGLISH (See N64-11657 03-12) OTS: $1.75

Based on the material of the Soviet high-latitudinal observatories and drifting stations, synoptical charts of magnetic disturbances (r_H^V) have been made for 1957–1958. Mean two-hour charts for 1957 and some examples of successive hourly charts of disturbances are given. There is found to be a considerable variation of disturbance distributed in the universal time. This distribution is characterized by the existence of separate disturbance foci; seldom is this distribution of a zonal character. The disturbance distribution frequently exhibits disorderly changes from hour to hour, but sometimes the disturbance foci may remain in the same position for several hours, that is, without any displacement as to the earth's surface. Mean synoptical charts of disturbances can be used for forecasting disturbances of the earth's magnetic field. Author

N64-11661* National Aeronautics and Space Administration, Washington, D.C.

SOME PECULIARITIES OF VARIATIONS IN THE VERTICAL COMPONENT OF THE MAGNETIC FIELD OF THE EARTH IN THE ARCTIC OCEAN

L. N. Zhigalov *In its* Geomagnetic Disturbances Dec. 1963 p 36–42 refs (See N64-11657 03-12) OTS: $1.75

The material of geomagnetic observations of the North Pole-6 drifting station has been considered together with the material of the U.S.S.R. high latitudinal Arctic geomagnetic observatories. It is detected that, far from the auroral zone, the character of geomagnetic field disturbances is well correlated with the ocean depth. Author

N64-11662* National Aeronautics and Space Administration, Washington, D.C.

ON THE NATURE OF THE COASTAL EFFECT

Ye. A. Ponomarev *In its* Geomagnetic Disturbances Dec. 1963 p 43–52 refs (See N64-11657 03-12) OTS: $1.75

The theory of the skin effect which occurs in metal conductors is used to describe the Antarctica coast effect. Observed characteristics of the coastal effect include: (1) The level of relative magnetic-field variations increases sharply near the coast line. (2) Near the coast, the vector of variations in magnetic-field strength is only half as great as at coastal lines with electrodes placed in crystalline rocks. (3) In the amplitudes on the irregular part of H-component variations, there is no dependence on the distance to the coast line. The results of calculations based on the skin-effect theory are compared with experimental data. P.V.E.

N64-11663* National Aeronautics and Space Administration, Washington, D.C.

STATIONARY MICROVARIATION STATION WITH PHOTOELECTRONIC AMPLIFICATION

N. V. Lipskaya, N. A. Deniskin, Yu. M. Yegorov, and V. F. Shel'ting *In its* Geomagnetic Disturbances Dec. 1963 p 53–60 refs (See N64-11657 03-12) OTS: $1.75

A description is given of a microvariation station with photoelectronic amplification. The station is designed for durable registration of microvariations of the earth's magnetic field, with a resolution by amplitude of some thousand parts of a gamma (10^{-8} oersted), and with a frequency up to one cycle per second. A high-sensitivity low-inertia quartz magnetic balance serves as an element sensitive to the field. Oscillations of a light flow, reflected from a moving balance mirror, are transformed into a photocurrent, intensified, and registered. Transformation and further intensification of light energy are made with the help of a photoelectronic multiplier. Author

N64-11664* National Aeronautics and Space Administration, Washington, D.C.

SECULAR VARIATIONS OF THE GEOMAGNETIC FIELD OF THE EAST ANTARCTIC

S. M. Mansurov *In its* Geomagnetic Disturbances Dec. 1963 p 61–66 refs (See N64-11657 03-12) OTS: $1.75

The secular geomagnetic variations for the 1957 to 1959 period have been drawn using the data of the U.S.S.R. Antarctic magnetic observatories. The attention was drawn to the

great amplitude of the long-period variation in H-component, superimposed on general secular variations. The change of Z-secular variation signs at Mirnyy and Vostok observatories has been noticed. Author

N64-11740* RAND Corp., Santa Monica, Calif.
GEOMAGNETISM AND THE IONOSPHERE
E. H. Vestine and J. W. Kern Oct. 1963 39 p refs Prepared for Proc. of Conf. on Artificial Satellites, Blacksburg, Va., 12–16 Aug. 1963
(NASA Contract NASr-21(05))
(NASA CR-52904; P-2801) OTS: $3.60 ph, $1.37 mf

The geometry of the magnetosphere and the dynamics of energetic particles and plasma trapped within it are discussed in relation to some problems of geomagnetism. Local acceleration of trapped particles is discussed, and the possible origins of electric fields and their roles in this and other magnetospheric phenomena are outlined. It is found that many phenomena of interest may be newly interpreted in terms of a slight extension of the original Chapman–Ferraro theory of geomagnetic storms. Author

N64-11785 Joint Publications Research Service, Washington, D.C.
NEUTRAL HYDROGEN IN THE EARTH'S ENVIRONS AND IN INTERPLANETARY SPACE
V. G. Kurt 17 Dec. 1963 38 p refs Transl. into ENGLISH of an article from Vsp. Fiz. Nauk (Moscow), v. 81, no. 2, Oct. 1963 p 249–270
(JPRS-22331; OTS-64-21044) OTS: $1.00

A literature review concerning the presence of neutral hydrogen in the earth's environs and in interplanetary space is presented. Subjects included in this review are: (1) experimental proof of the existence of hydrogen in the upper atmosphere and in interplanetary medium; (2) the distribution of hydrogen in the earth's upper atmosphere; (3) the earth's albedo during observation in the Lyman alpha line and radiation transfer; and (4) the effects of the geocorona on the earth's upper atmosphere. I.v.L.

N64-11797* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WORLD MAGNETIC SURVEY DATA
S. Hendricks and J. C. Cain Aug. 1963 30 p
(NASA TM X-51255; NASA-X-611-63-178) OTS: $2.60 ph, $1.10 mf

The distributions of magnetic survey information available from all sources since 1900 are analyzed. The data are tallied according to the distribution by area and decade and by the component measured. The positions of observatory, possible repeat stations, and all other data are mapped on world charts. The deficiencies in coverage are noted, and recommendations for the IQSY are made. Author

N64-11815 Air Force Special Weapons Center, Kirtland AFB, N. Mex.
EXPERIMENTAL TESTS FOR THE ACCELERATION OF TRAPPED PARTICLES
Richard L. Kaufmann Jan. 1963 38 p refs
(AFSWC-TDR-62-133; SWC-TDR-62-133; AD-297083)

Mechanisms which would result in the acceleration of charged particles within the magnetosphere are discussed in terms of the responses expected from experimental instruments as they pass through acceleration regions. A series of experimental tests is outlined which can determine if acceleration of trapped particles is important. The mechanisms discussed include Fermi acceleration, which can accelerate protons to tens or hundreds of kilovolts, and can increase the energy of trapped electrons several hundredfold before they are lost in the dense atmosphere. A change in the intensity of the solar wind, or in the strength of a ring current, can change the energy of trapped particles by the betatron mechanism. Electrons can be accelerated to kilovolt energies by the setting up of plasma oscillations, by acceleration within moving clouds, or by intrusions of solar plasma. Finally, particles may be accelerated to energies of 10 kilovolts or more in the vicinity of neutral lines. Author

N64-11848 Joint Publications Research Service, Washington, D.C.
WEATHER SATELLITES AND ROCKETS
V. P. Petrov and A. A. Sochivko 24 Apr. 1963 72 p Transl. into ENGLISH of Ch. 3 and 4 from the book "Iskusstvennyye Sputniki Zemli i Pogoda" Leningrad, Hydrometeorol. Publ. House, 1961 p 60–98
(JPRS-18882; OTS-63-21665) OTS: $2.00

CONTENTS:
1. THE UPPER ATMOSPHERE AND ITS INVESTIGATION WITH SATELLITES AND ROCKETS V. P. Petrov and A. A. Sochivko p 1–35 (See N64-11849 03-12)
2. METEOROLOGICAL SATELLITES V. P. Petrov and A. A. Sochivko p 36–69 (See N64-11850 03-12)

N64-11849 Joint Publications Research Service, Washington, D.C.
THE UPPER ATMOSPHERE AND ITS INVESTIGATION WITH SATELLITES AND ROCKETS
V. P. Petrov and A. A. Sochivko *In its* Weather Satellites and Rockets 24 Apr. 1963 p 1–35 (See N64-11848 03-12) OTS: $2.00

The general structure and composition of the upper atmosphere are reviewed, and satellite and rocket discoveries regarding the upper atmosphere are discussed. Two of the most important of these discoveries have led to the establishment of two facts of utmost importance in geophysics. These facts are: (1) The earth is surrounded by layers of intense cosmic radiation. (2) The density of the atmosphere above 500 km is sixteen to forty times higher than was estimated prior to 1955. The first of these discoveries was made with the Cerenkov and gas-discharge counters. Observations of satellite orbits played a large part in the second discovery. I.v.L.

N64-11850 Joint Publications Research Service, Washington, D.C.
METEOROLOGICAL SATELLITES
V. P. Petrov and A. A. Sochivko *In its* Weather Satellites and Rockets 24 Apr. 1963 p 36–69 (See N64-11848 03-12) OTS: $2.00

Meteorological recording and transmitting equipment of, and observations made by, Vanguard II, Explorer VIII, Tiros I, and Tiros II are described. I.v.L.

N64-11881 Paris U. (France)
AVIONICS ASPECTS
Etienne J. Vassy *In* Advisory Group for Aeron. Res. and Develop. Proc. of the 12th AGARD Gen. Assembly Sep. 1962 p 85–91 In FRENCH (See N64-11877 03-01)

A brief chronology of the events of the last 10 years which are related to the accomplishments of the AGARD Avionics Panel is presented. A meeting of the Panel in 1956 defined the word avionics as "the application of electronics to aeronautics". The activities of the Panel have since included flight research, guidance and control, air traffic control, ionospheric research, radar, radio communication and ionospheric absorption, satellite tracking, data handling, navigation systems, nuclear auxiliary power systems, and satellite instrumentation. Satellite tracking is cited as one example of international cooperation, and joint ionospheric and radio communications studies as another. The next meeting of the Panel will consider space vehicles and the problems they present concerning microminiaturization, minimal energy expenditure, and piloted systems. M.P.G.

N64-11938 Emmanuel Coll., Boston, Mass.
THE BOUNDARY CONDITIONS AT THE EARTH'S SURFACE DURING ATMOSPHERIC DIFFUSION PROCESSES [ZUR ERDBODEN-RANDBEDINGUNG BEI ATMOSPHARISCHEN DIFFUSIONSPROZESSEN]
F. Wipperman Bedford, Mass., Office of Aerospace Res., [1963] 20 p Transl. into ENGLISH of an article from Beitr. Phys. Atmosphäre (Frankfurt, W. Germany), v. 32, 1959 p 43–52 refs
(Contract AF 19(604)-8505)
(ETG-63-26; AD-424514)

Considered in the studies were: one-dimensional random flight against an elastic barrier; three-dimensional random flight against an elastic barrier and the effect of a partially absorbent earth's surface on the concentration field of a continuous point source. This consideration of random flight against an elastic barrier permits a physical interpretation of the interaction factor, which appears in the boundary conditions for the earth's surface in atmospheric processes where the particles arriving at the surface of the earth are partly absorbed and partly reflected. C.L.W.

N64-11996 Weapons Research Establishment (Australia)
IONOSPHERIC DATA FOR NOVEMBER 1962 FROM WOOMERA, SOUTH AUSTRALIA
Sep. 1963 24 p
(CPD 1962/11 (W))

Tables of the hourly values of the customary ionospheric parameters are given. Author

N64-11997 Weapons Research Establishment (Australia)
IONOSPHERIC DATA FOR DECEMBER 1962 FROM WOOMERA, SOUTH AUSTRALIA
Oct. 1963 24 p
(CPD 1962/12 (W))

Tables of the hourly values of the customary ionospheric parameters are given. Author

N64-12069 Joint Publications Research Service, Washington, D.C.
DETERMINATION OF THE INTERPOLATION ERROR OF ASTRONOMIC-GEODETIC PLUMB-LINE DEFLECTIONS IN WEST BOHEMIA KRAJ
Milan Bursa 31 Dec. 1963 16 p refs Transl. into ENGLISH of an article from Prace Geofysikalnino Ustavu Cesk. Akad. Ved (Prague), no. 162, Geophys. ser., 1962 p 11–23
(JPRS-22538; OTS-64-21174) OTS: $0.50

The solution of many problem in basic geodesy requires a knowledge of the components of astronomic-geodetic plumb line deflections ξ,η at stations considerably closer together than the mean distance between astronomic geodetic stations. The numerical value of the error in interpolation of the components ξ and η is derived. The mean square error of linear interpolation of the components of the astronomic geodetic deflection of the plumb line σ was found to be $\pm 2.5''$, when the density of the astronomic stations is 1 station per 1,700 km^2. The maximum error was approximately 5". R.T.K.

N64-12085 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THE DESYATKA GOES UP INTO THE STRATOSPHERE
Iv. Frolov 7 May 1963 9 p Transl. into ENGLISH from Russian Newspaper, Sovetskaya Rossiya, no. 46, 23 Feb. 1963 p 4
(FTD-TT-63-321/1+2; AD-409723)

A correspondent's account of a Russian bomber flying a rocket launching mission is presented. J.E.T.

N64-12158* Geophysics Corp. of America, Bedford, Mass.
INVESTIGATION OF THE INFLUENCE OF WINDS IN THE LOWER IONOSPHERE Final Report
Leslie G. Smith Aug. 1963 66 p refs
(NASA Contract NASw-489)
(NASA CR-55105; GCA-TR-63-25-N) OTS: $6.60 ph, $2.18 mf

A direct test of Whitehead's theory—that the occurrence of wind shears in the ionosphere could produce thin layers of high electron density which are responsible for the sporadic-E echoes on an ionosonde—was conducted by means of three Nike-Cajun sounding rockets. The rocket sounding data supported Whitehead's theory of the formation of the sporadic-E layer. There are two features, however, which the theory does not explain. The first feature concerns the height of the occurrence, and the second feature concerns the source of the ionization in the layers. Also, a simple method of trajectory determination for sounding rockets is presented. I.v.L

N64-12181 Lockheed Missiles and Space Co., Palo Alto, Calif.
MEASUREMENTS OF ARTIFICIALLY INJECTED ELECTRONS FROM SATELLITE 1962 BETA KAPPA Final Report
R. V. Smith, W. L. Imhof, J. C. Bakke, J. B. Reagan, and J. H. Rowland Aug. 1963 31 p refs
(Contract AF 19(628)-2421)
(LMSC-3-05-63-1; AFCRL-63-891; AD-423438)

Omnidirectional flux measurements have been carried out on a special Air Force satellite to establish the intensity, special extent, and spectral variations of fission electrons injected into trapped orbits in the earth's magnetic field from various high-altitude nuclear detonations. Data are presented from the period 27 October to 21 November 1962. Omnidirectional electron fluxes above 1.2 Mev are given in the B-L coordinate system for L = 1.18 to 1.70, and as a function of time also for L = 1.9 to 3.5. In addition, ratios of the outputs of two detectors with thresholds at 1 and 2 Mev are given versus L on 27 and 29 October, and versus time for L = 2.1, illustrating the spectral variations observed. Data analysis has not been completed; therefore, neither comparisons with other experiments nor conclusions are attempted. Author

N64-12191 RCA Service Co., Patrick AFB, Fla.
DIAL ORIENTATION AND PERSPECTIVE POINT COMPUTATION
George H. Rosenfield AF Missile Test Center Sep. 1963 37 p refs
(Contract AF 08(606)-5300)
(MTC-TDR-63-7; supersedes RCA Data Reduction Task Rept. 41-1; AD-424164)

This report presents a rigorous and general method for determining the spatial position of the center of projection in object space and the orientation of the optical axis using dial recordings. The technique is currently being used to reduce photogrammetric data from CZR camera operations at the Atlantic Missile Range and replaces earlier techniques which were neither as rigorous nor as general. Author

N64-12236 Aerospace Corp., El Segundo, Calif.
THE EFFECTS OF UNCERTAINTIES IN SOME ZONAL HARMONICS OF THE EARTH'S GRAVITY POTENTIAL ON SATELLITE POSITION DETECTION
P. T. Guttman 26 Jul. 1963 55 p refs
(Contract AF 04(695)-269)
(SSD-TDR-63-174; TDR-269(4110)-2; AD-415437) OTS: $5.60

Position errors which are being studied are those which would result from the generation of an ephemeris based on a faulty or incomplete gravitational model. The nature of the propagation of the errors along the orbit, the magnitude of the errors to be expected, and the dependency of these errors on the initial elements of the orbit and on the location at which observations are made for prediction purposes are presented. The investigation presented is based on a first-order analytical formulation of the problem of satellite motion about the asymmetric earth. In order to demonstrate the more salient features of the problem and to facilitate the mathematical analysis, the study is restricted to nearly circular, polar orbits. Author

N64-12297 Kiruna Geophysical Observatory (Sweden)
IONIZATION IN THE D-REGION DURING AURORAL BREAK UP EVENTS Scientific Report No. 3
Georg Gustafsson 31 Jul. 1963 30 p refs
(Contract AF 61(052)-288)
(AFCRL-63-869; AD-424119)

The investigation is based on photometer, riometer, and magnetometer recordings covering a period of 2 years. The correlation between the three parameters has been studied, and was found to be very good between the auroral luminosity and the absorption of cosmic noise. Using the continuity equation, the product ionization rate times recombination coefficient was obtained. The measured value was $5 \cdot 10^{-6}$ ion pairs/sec^{2}kR, and with the electron density deduced from the simultaneous absorption measurements, a recombination coefficient is obtained which is higher than the ionization rate calculated for the ionization by X-rays. The conclusion derived from these measurements is that the ionization causing the absorption is made mainly by direct ionizing particles. Author

N64-12301 Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
TROPOSPHERIC PHASE FLUCTUATIONS AT S-BAND
H. A. Von Biel Griffiss AFB, N.Y., Space Defense Systems Lab., Oct. 1963 27 p refs
(Contract AF 30(602)-2840)
(CAL-UB-1725-1; RADC-TDR-63-408)

A tropospheric propagation experiment to obtain the mean square phase fluctuations at 2250 Mc, over a 48-mile path, is described. Experimental data presented pertain to a 10-minute time interval on a meteorologically quiet day. Results from this experiment indicate that the mean square value of the phase fluctuations was approximately 6.2×10^{-3} square radians for this particular day. Estimates of the scale size and the intensity of the fluctuations of the refractive index are given. Author

N64-12342 Air Force Systems Command, Wright-Patterson AFB, Ohio
MOVEMENT OF KHGIMIP (KHARKOV STATE INSTITUTE OF MEASURES AND MEASURING INSTRUMENTS) QUARTZ CLOCKS AND THE IRREGULARITY OF EARTH'S ROTATION DURING 1951-1957
V. I. Turenko 3 Sep. 1963 17 p refs Transl. into ENGLISH of an article from Tsirkulyar Astron. Obs. (Khar'kov), no. 42, 1961 p 14-24
(FTD-TT-63-542/1+2; AD-420857)

A study of the movement of group frequency standard quartz clocks (KHGIMIP) and of the irregularity in rotation of the earth (with respect to these clocks) is discussed. From the observed movements of the clocks, formulas for determining the "aging" of the clock movements were developed. Examination of the curves of the movements of all the clocks against the background of their "aging" indicated the following conclusions: (1) In the movements of all the clocks, there is an inherent general fluctuation of movements. (2) The general fluctuation of movements is time distorted in all clocks and in different ways. A "residual" curve of the irregularity of the earth's rotation is given, relative to the year 1951.
P.V.E.

N64-12345 Science Council of Japan, Tokyo
IGC DATA OF IONOSPHERIC DRIFTS AT YAMAGAWA IN JAPAN
A. Aono, K. Tsukamoto, and M. Ichinose, comps. Mar. 1963 27 p

IGC Ionospheric drift measurement has been made at Yamagawa Station (Lat. 31°12.5'N, Long. 130°37.7'E) in Japan, using the closely spaced receivers fading method. The ionospheric drifts are measured for the E and F regions on two different frequencies for 20 minutes in every hour on RWIs, i.e., 10 consecutive days in each of the four seasons. Author

N64-12361 Navy Electronics Lab., San Diego, Calif.
ELECTRON DENSITY PROFILE IN THE IONOSPHERE D-REGION. CONSTRUCTION OF A MODEL ACCOUNTING FOR CERTAIN CHARACTERISTICS OF THE LARGE, NIGHTTIME, PHASE AND AMPLITUDE FLUCTUATIONS OF VLF SIGNALS IN ARIZONA DURING SUMMER
E. E. Gossard and M. R. Paulson 23 Aug. 1963 38 p
(NEL 1178; AD-422949)

The objective was to develop a capability for predicting the phase and amplitude of VLF radio signals, specifically, to devise a model or mechanism to explain why the ionospheric D-region exhibits more irregular fluctuations at night than during the day. Phase and amplitude measurements were made during the night and day over short VLF paths. The experimental data occasionally showed very large, abrupt phase changes approximating 180° or 360°. The data may be explained by a model in which the base of a nighttime E-layer occurs at 100 km, with a ledge of electron density of approximately 180 electrons/milliliter extending below it a height of 90 to 95 km. Perturbations of this lower boundary layer moving horizontally can cause large phase and amplitude fluctuations leading to 180° or 360° phase changes. Author

N64-12405* RAND Corp., Santa Monica, Calif.
NOTE ON LOW-LEVEL GEOMAGNETIC RING-CURRENT EFFECTS
E. H. Vestine Repr. from J. Geophys. Res., v. 68, no. 17, 1 Sep. 1963 p 4897-4907 refs
(NASA Contract NASr-21(05))

Various measurements of the intensity of radiation within the inner Van Allen belt have indicated little possibility that the

equatorial magnetic field of the belt should exceed 0.5 γ. Th 12-year means of geomagnetic disturbance data show an equatorial latitude variation, which could arise from a transient equatorial ring current at a height within the outer reaches of the inner belt. This small transient equatorial ring current may be introduced to suitable equatorial heights by downward expansion of a higher ring current present during magnetic storms. Another possibility is increased westward current flow within the equatorial ionosphere or enhanced compression of the equatorial magnetosphere during storm days. Author

N64-12406* Southwest Center for Advanced Studies, Dallas, Tex.
SOME DEDUCTIONS FROM A MEASUREMENT OF THE HYDROGEN ION DISTRIBUTION IN THE HIGH ATMOSPHERE
W. B. Hanson, T. N. L. Patterson, and S. S. Degaonkar Repr. from J. Geophys. Res., v. 68, no. 22, 15 Nov. 1963 p 6203–6205 refs
(NASA Grant NsG-269-62)

The theoretical distribution of H^+ according to the reaction, $H + O^+ \rightleftharpoons H^+ + O$, and its reverse were taken as a source and loss process for protons. Hydrogen and atomic oxygen were assumed to be distributed according to the hydrostatic equation, their concentration at 500 km being taken as 7×10^4 cm^{-3} and 2.7×10^7 cm^{-3}, respectively. Only Coulomb diffusion was considered. The rate coefficient of the above reaction was found to be 3.9×10^{-10} cm^3/sec^{-1}. The upward flux of protons at 900 km, corresponding to this rate coefficient, was 1.3×10^7 protons cm^{-2}/sec^{-1}. Since the deduced hydrogen concentration in the equation $n(H) = 8/9\ n(H^+)n(O)/n(O^+)$ is influenced by the magnitude of $n(H^+)$ in the lower-altitude region but not by the shape of the proton distribution curve, it appears that satellite measurements of $n(H^+)$ in the 400 to 500 km region with the aid of the above equation provide means of obtaining the global distribution of n(H). I.v.L.

13 HEAT TRANSFER AND THERMODYNAMICS

Includes ablation; cooling; heating; and other thermal effects. *For aerothermodynamics see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 03 Aerodynamics of Wings, Rotors, and Control Surfaces. *For combustion see*: 26 Propellants and Combustion. *For related information see*: 11 Fluid Mechanics.

N64-11471 IIT Research Inst., Chicago, Ill.
THERMAL PROPERTIES OF REFRACTORY ALLOYS Technical Documentary Report [1 May 1962–31 May 1963]
J. C. Hedge, C. Kostenko, and J. I. Lang Wright-Patterson AFB, Ohio, AF Mater. Lab. Jun. 1963 139 p refs
(Contract AF 33(657)-8810)
(ASD-TDR-63-597; AD-424375) OTS: $2.75

The objective of this program was the determination of the thermal properties of fifteen selected refractory materials. The materials investigated were boron carbide, zirconium nitride, spinel, beryllium oxide, six columbium alloys, three tantalum alloys, and two molybdenum alloys. The thermal conductivity, specific heat, and linear thermal expansion were measured from room temperature to the melting point, or 5000° F, whichever was lower. Author

N64-11553* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
THE EFFECT OF RESIN COMPOSITION AND FILLERS ON THE PERFORMANCE OF A MOLDED CHARRING ABLATOR
Roger W. Peters and Kenneth L. Wadlin Washington, NASA, Dec. 1963 39 p refs
(NASA TN D-2024) OTS: $1.00

A series of phenolic-based flat-face charring ablation specimens was tested in a subsonic arc jet at a cold-wall heating rate of 110 Btu/ft^2-sec for periods of time ranging from 30 sec to 10 min. Comprehensive temperature surveys were made within the ablating materials, and the char depths and char character were studied. In most specimens, the phenolic resin was combined with nylon powder plus other additives to decrease density, improve char integrity, and to provide greater thermal protection time. The lower density composites containing microballoons showed improved thermal protection time, but suffered greater shape changes. The composites containing high-temperature fibrous fillers had improved char integrity, greater thermal protection time, and minimum shape change. Author

N64-11558* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
RADIANT HEAT TRANSFER TO ABSORBING GASES ENCLOSED BETWEEN PARALLEL FLAT PLATES WITH FLOW AND CONDUCTION
Thomas H. Einstein 1963 26 p refs
(NASA TR R-154) GPO: $0.35

An analysis is given for obtaining two-dimensional temperature profiles and heat transfer in a radiation-absorbing gray gas of uniform absorptivity under the combined influence of radiation, flow, and conduction. The gas is enclosed in a channel formed by two parallel black surfaces of infinite width and finite length. The characteristics of combined conduction and radiation in a stationary gas and of radiation of a flowing gas without conduction are specifically investigated. The effects of conduction and gas flow on radiation transfer between the absorbing gas and the surfaces of the channel are presented in terms of pertinent dimensionless parameters. Author

N64-11559* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
RADIANT HEAT TRANSFER TO ABSORBING GASES ENCLOSED IN A CIRCULAR PIPE WITH CONDUCTION, GAS FLOW, AND INTERNAL HEAT GENERATION
Thomas H. Einstein 1963 29 p refs
(NASA TR R-156) GPO: $0.35

An analysis is presented for determining the heat transfer to a gray uniformly-absorbing gas enclosed in a black circular pipe under the combined influence of radiation, gas flow, and conduction. The presence of distributed energy sources in the gas is also taken into account. Results are presented in terms of pertinent dimensionless parameters for heating a flowing gas by radiation emitted from isothermal pipe walls, and also for heating a flowing gas and the enclosing pipe walls by radiation emitted from a cylindrical heat-generating gaseous core in the center of the pipe, which situation is typical of a plasma jet, an electric arc, or a coaxial-flow gaseous reactor. Author

N64-11560* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
SOLUTIONS OF THE IONIZED RADIATING SHOCK LAYER, INCLUDING REABSORPTION AND FOREIGN SPECIES EFFECTS, AND STAGNATION REGION HEAT TRANSFER

John T. Howe and John R. Viegas 1963 23 p refs
(NASA TR R-159) GPO: $0.30

The equations for the nonadiabatic shock layer in the stagnation region of bluff bodies are solved for flight speeds up to 50,000 fps in air. The effects of energy transport by conduction, diffusion of dissociated and ionized species, and gaseous radiation (with reabsorption) are included in the analysis. The effects of a foreign species on the radiant energy transfer in the shock layer are also investigated. Convective and radiative heat-transfer rates in the stagnation region of the body are obtained from the solutions and are compared with the results of others. Coupling between the two modes of heat transfer is examined. A simplified method for predicting the effect of radiative transport on convective heat transfer is discussed. Shock standoff distance determined from the solutions is presented and compared with the results of other investigations. Results indicate that coupling among the energy transfer processes may reduce the heat transfer by as much as 50 percent. Author

N64-11592 Oak Ridge National Lab., Tenn.
FABRICATION OF THE HEAT EXCHANGER TUBE BUNDLE FOR THE MOLTEN-SALT REACTOR EXPERIMENT
R. G. Donnelly and G. M. Slaughter 9 Dec. 1963 36 p refs
(Contract W-7405-eng-26)
(ORNL-3500)

Procedures were successfully developed for welding and back brazing the closely spaced 326 tube-to-tube sheet joints in the unit. The welded and back-brazed design provides a double seal between the fuel and coolant salts, and was used because of the necessity for high joint integrity. Trepan grooves were machined in the weld side of the tube sheet so that low-restraint edge-type welds could be made. This technique greatly reduces the cracking problems associated with welding thin-walled tubes to thick tube sheets. The 82 Au–18 Ni (wt %) brazing alloy used in this application is corrosion resistant, ductile, and produces joints exhibiting satisfactory mechanical strength. Good general flow of the brazing alloy was evident, and ultrasonic examination of brazed joints showed only minor scattered porosity. The completed unit passed both helium-leak and 800-psi hydrostatic tests. Author

N64-11715 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
INFLUENCE OF THE DIFFUSION OF RADIATING IMPURITIES ON CONVECTIVE HEAT EXCHANGE
A. N. Rumynskiy *In its* J. of Appl. Mech. and Tech. Phys. Selected Articles 3 May 1963 p 39–56 refs Transl. into ENGLISH of an article from Zh. Prik. Mekhan. i Tekhn. Fiz. (Moscow), no. 2, 1962 (See N64-11711 03-01) OTS: $6.60

The boundary layer near the forward critical point of an axially symmetrical blunt-nosed body, from the surface of which active (radiating) gas is released is considered. It is assumed that the boundary layer represents a binary mixture, in which no chemical reactions take place. To separate the effect of the influence of the diffusion of the radiating gas on the heat exchange, the influence of the radiation of the gas components of the main stream on the flow of the gas is neglected. Under the indicated assumptions, and using a few supplementary simplifying premises, formulas are derived for the calculation of the convective heat flows in the vicinity of the critical point of a blunted body with radiating gas released from its surface. Author

N64-11746 Princeton U., N.J.
A THEORETICAL ANALYSIS OF HEAT TRANSFER IN REGIONS OF REVERSE FLOW
R. W. Garvine Jun. 1963 29 p refs
(AF Grant AFOSR-112-63)
(Rept. 652; AFOSR-5330; AD-424398)

Inquiry is made into a fundamental aspect of heat transfer in a laminar flow where separation has induced a reverse or backward moving layer of fluid. A Couette flow model is chosen with linear velocity profile, but with a portion of the profile reversed. In this model the features of simultaneous upstream and downstream convection are retained. Analytical solutions are found for the case of a sinusoidal wall temperature. It is concluded that the convection effect of the reverse layer cannot be ignored in practical cases. Author

N64-11772 General Dynamics/Astronautics, San Diego, Calif.
LIGHTWEIGHT THERMAL PROTECTION SYSTEM DEVELOPMENT VOLUME II. MATERIALS, EXISTING DATA, AND RECOMMENDED DATA ACQUISITION [Summary Report, 1 Jul. 1962–1 May 1963]
R. A. Lange, H. Jones, J. M. Ryan, H. Rosenthal, J. Stitt et al
Wright-Patterson AFB, Ohio, AF Mater. Lab., Jun. 1963 36 p
(Contract AF 33(657)-9444)
(ASD-TDR-63-596, Vol. 2; AD-422941)

This volume describes the known properties of insulation materials and makes recommendations for acquiring additional data. Author

N64-11777 Columbia U., New York, N.Y. Heat Transfer Res. Facility
FORCED-FLOW BOILING IN ROD BUNDLES AT HIGH PRESSURE
Bruce Matzner and John S. Neill (du Pont de Nemours (E. I.) and Co.) Aiken, S.C., Savannah River Lab., Sep. 1963 46 p refs
(Contracts AT(30-3)-187 and (AT (07-2)-1)
(DP-857) OTS: $1.00

The thermal and hydraulic characteristics of electrically heated 7- and 19-rod bundles cooled by forced flow of water with bulk boiling at 1000 psia were measured. The ranges of the variables investigated were: heat fluxes as high as 550,000 pcu/ (hr)(ft^2), exit steam qualities as high as 59%, mass velocities from 500,000 to 2,000,000 lb/(hr)(ft^2), and heated lengths of 3 and 6 ft. The power of the test sections was as high as 3.35 Mw. The sudden deterioration in heat transfer (incipient burnout), as the heat flux or the quality was increased, was detected by thermocouples against the heater wall and by the change in electrical resistance of the rods. Operation at progressively higher surface temperatures beyond the point of incipient burnout was explored. The effect on heat transfer and pressure drop of spirally wrapped wires, which were used for spacing the rods, was observed. The pressure drops in two-phase flow were correlated. Author

N64-11899* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUBSONIC AERODYNAMIC HEAT TRANSFER TO A SURFACE RECESSED WITHIN A FORWARD STAGNATION REGION SLIT
Samuel J. Scott Washington, NASA, Dec. 1963 11 p refs
(NASA TN D-2034) OTS: $0.50

A flat-faced cylindrical model was tested in a high-temperature subsonic arc jet to investigate the heat transfer to a surface recessed within a slit in the forward face of the model. Heat-transfer measurements were made for various recession depths, and varying amounts of air injected over the recessed surface. Injected air was allowed to exit through

the surface slit into the test stream. Heat-transfer rates measured on the model face and the recessed surface were compared to indicate effects of recession depth and flow rate of injected air. Large reductions in heat-transfer rates to the recessed surface were indicated and are presented as functions of recessed depth and rate of airflow. Author

N64-11903* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A STUDY OF THE CONVECTIVE AND RADIATIVE HEATING OF SHAPES ENTERING THE ATMOSPHERES OF VENUS AND MARS AT SUPERORBITAL SPEEDS

Fred A. Demele Washington, NASA, Dec. 1963 31 p refs (NASA-TN-D-2064) OTS: $0.75

Analysis indicates that for blunt capsule entries at speeds somewhat greater than the Hohmann-transfer planetary arrival velocities, the predominant heating mode is by radiation in the case of Venus, and by convection in the case of Mars. It is shown that sweepback of the bow shock can reduce the radiative input so drastically that for Venus entry the total combined radiative and convective heat input of a conical shape will be about half that of a blunt capsule. Because convective heating predominates in the Mars entry, little or no reduction in total heat is afforded by conical shapes. However, since the radiation is highly dependent on velocity, conical shapes appear attractive for Mars entry at higher velocities (say 40,000 fps) corresponding to those for shortened interplanetary trip times. There is strong experimental evidence that the intensity of radiation is significantly influenced by gas composition. Author

N64-11968 Joint Publications Research Service, Washington, D.C.

EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF THE VIBRATION OF A SPHERE OF HEAT AND MASS EXCHANGE IN A TURBULENT STREAM OF AIR

S. S. Chervyakov *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 27–34 refs (See N64-11965 03-01) OTS: $3.50

The results of an experimental investigation of the influence of the vibration of a sphere on convective heat and mass exchange within the Reynolds-number range of 3×10^4 to 1.3×10^5 are presented in graphic form. Spheres 140 mm and 95 mm in diameter were used. The spheres were composed of a finely porous ceramic material of the following composition (in percent): chamotte 24, Latnindk clay 27, diatomite 48, and waterglass 1. The total porosity was 30%, with pores ranging in size from 0.3 to 1.4 microns. P.V.E.

N64-11970 Joint Publications Research Service, Washington, D.C.

HEAT EXCHANGE OF A DISK AND A SCREEN WITH NONUNIFORM TEMPERATURE DISTRIBUTION ON THE HEAT-EXCHANGE SURFACES

V. M. Kapinos *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 48–63 refs (See N64-11965 03-01) OTS: $3.50

The problem of heat exchange between a gas-turbine disk and its cooling screen is examined for the case of an arbitrary distribution of temperature in the disk, in the screen, and in the gap. Formulas for determining the heat exchange, based on an approximate theoretical solution and on the results of an experimental investigation of the heat exchange of a freely rotating disk, are presented. P.V.E.

N64-11975 Joint Publications Research Service, Washington, D.C.

A GENERALIZATION OF CERTAIN STUDIES OF RADIATION HEAT-EXCHANGE IN A FLAME FURNACE

A. D. Klyuchnikov and Ye. Ye. Agarkov *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 103–115 refs (See N64-11965 03-01) OTS: $3.50

Results are presented of a generalization of an experimental study of radiation heat-exchange in a compartment kiln, with use of compression of various fuels, and a wide range of operating conditions and other parameters. A critical relationship characterizing heat-exchange in a compartment kiln is obtained. Author

N64-11976 Joint Publications Research Service, Washington, D.C.

THE INFLUENCE OF HEATING VELOCITY ON THE KINETICS OF CALCINING MINERAL SUBSTANCES

G. A. Kasparyan *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 116–127 refs (See N64-11965 03-01) OTS: $3.50

Results are presented of an experimental study of the kinetics of calcining certain colloidal capillary-porous bodies. The influence of the heating velocities on the course of low- and high-temperature entothermal effects is established, and attempts are made to standardize the curves of the kinetics of calcining. Author

N64-11978 Joint Publications Research Service, Washington, D.C.

EFFICIENCY INDICES OF TRANSFER PROCESSES

I. T. Elperin *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 138–149 refs (See N64-11965 03-01) OTS: $3.50

Indicated is the possibility of using these indices in making a choice of an optimal means of organization and regimes for a transfer process. Author

N64-11979 Joint Publications Research Service, Washington, D.C.

THE KINETICS OF DRYING LUMPY MATERIALS IN A MOVING LAYER

Yu. A. Berman *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 150–162 refs (See N64-11965 03-01) OTS: $3.50

An analytical solution to the problem of determining the kinetic characteristics of drying processes which involve the lowering of the evaporation surface of lumpy moist materials (peat, coal, shavings, etc.) is presented. Conditions of heat transfer and mass transfer in a moving layer, where the moist material moves opposite to the drying heat-transfer medium, are examined. The method proposed is adaptable to stack-type dryers. P.V.E.

N64-11982 Joint Publications Research Service, Washington, D.C.

THE TRANSFER OF ENERGY IN A GRAY MEDIUM

P. K. Konakov *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 p 188–202 refs (See N64-11965 03-01) OTS: $3.50

By using the law of transfer for a particular property of a physical body, and the expressions for the vectors of mass- and heat-transfer in a continuous medium, the author examines the process of energy transfer in a gray medium consisting of two dependent components (molecular and radiant media) which transfer molecular and radiant energy. Author

N64-12061 Aerospace Corp., El Segundo, Calif. Engineering Div.

STAGNATION POINT HEAT TRANSFER IN A RELAXING GAS

Robert E. Wilson Nov. 1963 98 p refs
(Contract AF 04(695)-269)
(TDR-269(4305)-1; SSD-TDR-63-166) OTS: $9.60

Stagnation-point heat transfer in a gas undergoing relaxation of its internal energy is examined by solution of the equations of motion using the two temperature approach of Wang Chang and Uhlenbeck. The results are presented in parametric form and show that relaxation effects produce an adiabatic wall temperature above the free stream stagnation temperature, which is related to the thermal conductivity of the "inert" mode, the dimensionless relaxation length, the ratio of the translational mode temperature to the temperature of the relaxing mode at the edge of the boundary layer, and the magnitude of the internal energy undergoing relaxation. An experiment is described whereby the thermal conductivity of the "inert" mode, which is unknown, may be determined from adiabatic wall temperature measurements Author

N64-12121 Bureau of Mines, Berkeley, Calif. Berkeley Thermodynamics Lab.

LOW-TEMPERATURE HEAT CAPACITIES AND ENTROPIES AT 298.15° K OF AKERMANITE, CORDIERITE, GEHLENITE, AND MERWINITE

W. W. Weller and K. K. Kelley 1963 12 p refs
(BM-RI-6343)

Heat capacity measurements of akermanite ($Ca_2MgSi_2O_7$), cordierite ($Mg_2Al_4Si_5O_{18}$), gehlenite ($Ca_2Al_2SiO_7$), and merwinite ($Ca_3MgSi_2O_8$) were conducted over the temperature range from 50° to 298.15° K. The entropies at 298.15° K (expressed in cal/deg mole) were evaluated as follows: akermanite, 50.0 ±0.5; cordierite, 97.3 ±0.9; gehlenite, 47.4 ±0.4; and merwinite, 60.5 ±0.5. All four compounds have positive entropies of formation from their constituent oxides at 298.15° K; the values range from 4.6 cal/deg mole for akermanite to 10.1 cal/deg mole for cordierite. Author

N64-12156* Southern Research Inst., Birmingham, Ala.

THE EMITTANCE OF CALORIMETER DISCS Summary Report on Task 2

11 Jun. 1963 77 p refs
(NASA Contract NAS8-5196)
(NASA CR-55073) OTS: $7.60 ph, $2.51 mf

The work performed under this task order was concerned with the emittance of calorimeter sensing discs and the temperature cycling effects in air on special coatings. Specimen temperatures were monitored during the evaluations by attaching thermocouples to the back surface of the specimens. The emittance of the grooved specimens was consistently higher than the emittance for the smooth ones with the same exposure history. Also, there was less data scatter for the grooved specimens within any single run and less deviation for successive runs on the same specimen. The emittance-versus-temperature curve for the grooved specimen within the same exposure history generally was more linear, undoubtedly influencing the observation of less scatter within a run and less deviation between runs. There was rather good agreement in the emittance values for all of the grooved specimens on the first run on each. This disc should provide a reasonably predictable calorimeter sensing device. Author

N64-12180 California Inst. of Tech., Pasadena Firestone Flight Sciences Lab.

VISCOUS EFFECTS AND HEAT TRANSFER IN SEPARATED FLOW Final Technical Report

Lester Lees 8 Apr. 1963 8 p refs
(AF Grant AF-AFOSR-62-29)
(AFOSR-4712; AD-409616) OTS: $1.10

This report deals with the following investigations: (1) elimination of the semiempirical features of the Crocco–Lees method while retaining the flexibility gained by "unhooking" the velocity profile from the local pressure gradient; and (2) the development of a method that is sufficiently general to include heat transfer. Results include the following: (1) The length of the separated flow decreases markedly as cooling is increased for a given Mach number and Reynolds number at separation and incident shock strength. (2) A smooth approach to separation from the Blasius flow is no longer possible at a certain critical surface-to-free-stream temperature ratio (depending on Mach number). The laminar boundar layer becomes "supercritical" just as the adiabatic turbulent layer does in the Crocco–Lees mixing theory. This behavior indicates that the laminar boundary-layer shock-wave interaction on a highly cooled surface is qualitatively different from the usual phenomenon observed on adiabatic surfaces. I.v.L.

N64-12228 Grumman Aircraft Engineering Corp., Bethpage, N.Y.

PRESSURE AND HEAT TRANSFER MEASUREMENTS FOR HYPERSONIC FLOWS OVER EXPANSION CORNERS AND AHEAD OF RAMPS. PART I: MACH 5 AND 8 DATA FOR EXPANSION CORNER FLOWS. PART OF AN INVESTIGATION OF HYPERSONIC FLOW SEPARATION AND CONTROL CHARACTERISTICS

Louis G. Kaufman II Wright-Patterson AFB, Ohio, AF Flight Dyn. Lab., Sep. 1963 89 p refs
(Contract AF 33(616)-8130)
(ASD-TDR-63-679, Pt. 1; AD-423580)

Pressure and heat-transfer data were obtained for hypersonic flows over 40° expansion corners and ahead of ramps. Full and partial span ramps, having wedge angles up to 90°, were tested at two locations on a sharp leading-edge flat plate, with and without end plates. Pressure data were obtained for $M_\infty = 5$ for model length Reynolds numbers between 1.1 and 6.6 million. Both pressure and heat-transfer data were obtained for $M_\infty = 8$ for Reynolds numbers between 1.1 and 3.3 million. Author

N64-12275 Army Missile Command, Huntsville, Ala.

COMPLIANCE OF CORRUGATED EXPANSION JOINTS

F. Salzman 6 Nov. 1963 16 p refs Transl. into ENGLISH by Joint Publ. Res. Service of an article from Schweiz. Bauz. (Zurich), v. 127, no. 11, 1946 p 127–130
(RSIC-100; AD-423821)

Calculations show that in corrugated expansion joints the stiffness is higher than in a flat corrugated sheet because of the influence of hoop stresses. The quantity determining this influence is the value $x = \sqrt{R\ s}/\sqrt[4]{3(1-\nu^2)}$ known from the theory of cylindrical shells. With the aid of this quantity and the results of calculations given in curve form, it is possible to determine the deformation of a corrugated pipe both for rectangular as well as rounded shape of corrugation under the action of an axial tensile or compressive load P. Author

14 HUMAN BEHAVIOR

Includes crew training and evaluation; piloting; and psychological factors. *For simulators see*: 10 Facilities, Research and Support. *For related information see*: 16 Life Sciences.

N64-11522 Joint Publications Research Service, Washington, D.C.
THE INTERACTION OF THE ANALYZERS UNDER FLIGHT CONDITIONS ON AIRPLANES AND SPACESHIPS
V. V. Baranovskiy, M. D. Yemel'yanov, and A. G. Kuznetsov *In its* Transl. from Zhur. Vyshey Nervnoy Deyatel'nosti im. I. P. Pavlova 12 Feb. 1963 p 1–12 refs (See N64-11521 03-01) OTS: $1.00

The interaction of visual, vestibular, and motor sense organs under conditions simulating flight was investigated. Results indicate that: (1) Illusions result from changes in the interaction of receptors controlling space perception. (2) Illusions occur from adequate stimulation of the vestibular mechanism and can be caused by a conditioned reflex connection through the visual receptors. (3) The motor receptors play an important part in the phenomena of spatial analysis and synthesis. R.T.K.

N64-11523 Joint Publications Research Service, Washington, D.C.
ELECTROPHYSIOLOGICAL STUDY OF THE ACTIVITY OF CUTANEOUS AND MOTOR ANALYZERS UNDER CONDITIONS OF ACCELERATION EFFECTS
E. V. Marukhanyan, P. K. Isokov, B. F. Asyamolov, G. I. Pavlov, and V. V. Usachev *In its* Transl. from Zhur. Vyshey Nervnoy Deyatel'nosti im. I. P. Pavlova 12 Feb. 1963 p 13–24 refs (See N64-11521 03-01) OTS: $1.00

The sensorimotor activity of man during evaluation of various weights, under conditions of increased gravity created by acceleration, was investigated. The data indicated that during acceleration there is a disorder of the ability to estimate weight accurately, and under these acceleration conditions the amplitudes of the electromyograph were increased. R.T.K.

N64-11548* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BEHAVIORAL TESTING DURING A 7-DAY CONFINEMENT: THE INFORMATION PROCESSING TASK
Rollin M. Patton Washington, NASA, Dec. 1963 23 p refs (NASA TN D-1973) OTS: $0.75

Two subjects were confined for seven days in a mockup of a space capsule with a usable volume of 123 ft^3. A 4-hour-on, 4-hour-off duty schedule was maintained, with one subject working and one resting at all times. Various measures of physiological and behavioral functioning were taken. The subject's task was to locate and mark certain designated letters among an array of letters. Task complexity was manipulated by varying the number of designated letters and the ratio of designated to irrelevant letters within the array. The task was performed once during each duty period. Results are as follows. (1) Performance of the task was maintained at what appears to be a reasonably high level throughout the 7-day confinement which indicates that, under the conditions of this study, proficiency in an information-processing task can be maintained in a small capsule. (2) The hypothesis that, under unfavorable conditions (i.e., nonpreferred shifts), performance of relatively complex tasks would suffer greater decrements than would simple tasks was not confirmed, although the speed and error scores were markedly affected by variation in task complexity. I.v.L.

N64-11549* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BEHAVIORAL TESTING DURING A 7-DAY CONFINEMENT: THE PATTERN DISCRIMINATION TASK
Rollin M. Patton and Robert J. Randle, Jr. Washington, NASA, Dec. 1963 17 p refs (NASA TN D-1974) OTS: $0.50

Two subjects were confined for 7 days in a mockup of a small space capsule while a variety of physiological and behavioral tests were conducted. One of the latter, the pattern discrimination task, exhibited changes in quality of performance related to the duration of confinement and time of day. Changes were also shown to occur over the course of a single shift. Nevertheless, performance remained at an acceptably high level throughout, suggesting that a crew compartment of comparable volume may be considered for use in a 7-day mission. Author

N64-11649 National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
UNITED STATES EXPERIENCE ON THE UTILIZATION OF MAN'S CAPABILITIES IN A SPACE ENVIRONMENT
Charles W. Mathews *In* Comm. on Space Res. Life Sci. and Space Res. 1963 p 141–159 refs (See N64-11647 03-01)

This paper deals with the stresses on the flight crew in various phases of spaceflight missions, and the ability of the crew to perform piloting-type tasks, as well as other specific operations, in the presence of these stresses. The paper draws on information obtained from the flight research to date as well as from ground tests and analyses. From the results, one can conclude that man can very ably withstand the stresses of short duration missions into near space and has demonstrated ability to perform the type of tasks associated with flight crew operation. The chief unknown factors of future flight operations are the stresses produced by longer duration missions. Consideration of the problems involved leads to the conclusion that they are amenable to engineering solution at some expense to spacecraft weight and performance. It appears desirable therefore to utilize the flight crew to a high degree in future missions in the type of tasks where human judgment is needed or where significant simplification of on-board equipment may result. Author

N64-11709* National Aeronautics and Space Administration, Washington, D.C.
COORDINATION OF ARBITRARY MOVEMENTS OF A HUMAN BEING IN A CHANGING GRAVITATIONAL FIELD
L. V. Chkhaidze *In its* Prob. of Space Biol., Nov. 1963 p 483–495 refs (See N64-11665 03-01) OTS: $7.00

Volunteers were trained to exert paired finger pressures in such a way that the first pressure of each pair was twice the force of the second. The ratio F of the difference between the pressures and the magnitude of the second pressure was used as a criterion of performance. Training was carried out first under visual instrumental control until a value of F of 0.6 was attained, after which the subject had to carry out further practice under control of his own proprioceptive mechanisms until a stable performance level of 0.85 to 0.90 was attained. The performance was then recorded by means of a tensiometer immediately before and during exposure to an acceleration of 3 g and 7 g, and to an acceleration increasing gradually up to 7 g. A mean initial value of F of 0.83 was recorded; during exposure to 3 g this fell to 0.63, and to 0.57 on exposure to 7 g. The results show that in an increased gravitational field subjective assessment of force is impaired. When the duration of the task was increased, however, the value of F rose again. Author

N64-11808* National Aeronautics and Space Administration, Washington, D.C.
RETENTION OF HUMAN SYSTEM CAPABILITIES DURING MANNED SPACE FLIGHT
Robert L. Gervais (Douglas Aircraft Co., Inc.) and Eugene B. Konecci [1963] 33 p Presented at the 14th Intern. Astronautical Congr., Paris, 25 Sep.–1 Oct. 1963
(Paper 106)

The ecological philosophy of a space transportation system is postulated, and an ecological environmental evaluation is undertaken. Methods of defining and synthesizing the various requirements and constraints are advanced, such that the results of the evaluation can be implemented into the design of a space transportation system. In addition, vehicle-and-flight mechanics and dynamics are analyzed throughout all phases of flight, i.e., during boost, abort, space transfer, lunar and planetary operations, and entry; consequently, vehicle and effective man loadings are established. Methods of alleviating these loadings through various space or atmospheric maneuvers are then advanced, so that they become consistent with the established ecological requirements. Author

N64-11825 Maryland U., College Park
A LONG-TERM STUDY OF HUMAN PERFORMANCE IN A CONTINUOUSLY PROGRAMMED EXPERIMENTAL ENVIRONMENT
Jack D. Findley, Bernard M. Migler, and Joseph V. Brady Nov. 1963 114 p refs
(NASA Grant NsG-189-61)
(NASA CR-52913) OTS: $9.60 ph, $3.62 mf

A volunteer adult male was confined to a three-room experimental chamber for 5 months. A program of activities, controlled by automatic equipment, permitted the subject to engage in a particular sequence of activities. The terminal parts of the sequence allowed the subject to engage in more reinforcing activities and to choose among a greater selection of activities. Behavioral requirements in several activities were manipulated during the experiment. Performance changes were recorded in terms of frequency of selection of activities, duration of activities, and other quantitative and nonquantitative measures. The effects of some of the short-term manipulations in the conditions of the environment were observed on behaviors both closely and distantly related to the behavior being manipulated. The effects of prolonged social isolation and confinement resulted in the development of progressive behavior strain, which ultimately led to the termination of the experiment. These effects were described quantitatively in performance changes in many behaviors. Author

N64-11852 Joint Publications Research Service, Washington, D.C.
EXPERIMENTAL STUDIES IN COSMIC PHYSIOLOGY
P. V. Vasil'yev, A. D. Voskresenskiy, and O. G. Gazenko *In its* Sov. Rept. on Space Med. and Biol. 30 Apr. 1963 p 1–20 refs
(See N64-11851 03-01) OTS: $2.25

Two structural variants (empirical and theoretical) of physiological experiments are briefly characterized, and an analysis of certain data obtained in a theoretical approach to the physiology of forward accelerations is presented. Studies show that the most important immediate effects of forward accelerations consist of changes in pulmonary ventilation and redistribution of blood in the vascular system. In the lungs, the normal relationships in the distribution of blood and air are disturbed so that there is a reduction in the level of blood oxygenation. The drop in oxygen saturation of arterial blood and hemodynamic shifts can cause the development of cardiac and cerebral hypoxia. In this state, an augmented influx of impulses to the brain along different pathways implements the appearance of disturbances in central regulation which, in turn, reduces the compensatory mechanism of the organism. The appearance of pathological effects can be expected only with exposure to accelerations of a duration greater than one minute. P.V.E.

N64-11872 Joint Publications Research Service, Washington, D.C.
MAN AND TECHNOLOGY (OUTLINES IN ENGINEERING PSYCHOLOGY)
Boris Fedorovich Lomov 16 Dec. 1963 311 p refs Transl. into ENGLISH of the book "Chelovek i tekhnika (Ocherki inzhenernoy psikhologii)" Leningrad, Leningrad Order of Lenin State U., 1963 p 1–265
(JPRS-22300; OTS-64-21030) OTS: $5.00

A general review of engineering psychology problems is presented. First, the general characteristics of man as a link in control systems, including the speed, precision, and reliability of human activity, is discussed. Four aspects of the reception and processing of information by man are considered: (1) the relationship of the physical properties of signals to the characteristics of sensitivity of the human sensory apparatus; (2) the selection of the physical form of signals addressed to man; (3) the characteristics of the volume of information which man may receive, store, and process; and (4) the psychic processes through which information is received. The practical problem of the design of indicators is considered, and the problem of motor (reflex) components of control activity is related to the design of control components. M.P.G.

N64-12213 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio
PSYCHOLOGICAL ASPECTS OF EXTENDED MANNED SPACE FLIGHT Final Report
Julien M. Christensen Sep. 1963 35 p refs Presented at the Am. Astron. Soc. Symp. on the Exploration of Mars, Denver, 6–7 Jun. 1963
(AMRL-TDR-63-81; AD-423442)

A sampling of some of the relevant information available in psychology is offered, and areas that will require further attention before predictions in the behavioral area for the Mars trip can be made with confidence are identified. A twofold thesis is developed. First, psychology has legitimate and important contributions to make to the Mars trip. Second, the advantages, however, are mutual, i.e., it is confidently predicted that participation in this venture will force psychologists to reexamine their traditional principles and theoretical positions and will stimulate an attack on the basic issues of human behavior with refreshing insights gained from new points of vantage. Author

N64-12238 Army Missile Command, Huntsville, Ala.
PILOTING ERRORS AND AIRCRAFT INSTRUMENTS
Jean Israel 25 Oct. 1963 14 p Transl. into ENGLISH by Joint Publ. Res. of an article from Tech. Sci. Aeronaut. Spatiales (Paris), May–Jun. 1962 p 203–208
(RSIC-89; AD-424784)

This report shows how accurate information, received from instruments, can be misused so as to cause pilot reading errors and, hence, accidents. The instrumentation discussed deals with any object in the cockpit that gives the pilot a useful visual signal; the instruments are grouped into three

categories: (1) two-position instruments—luminous or magnetic indicators, stop-start buttons, left-right switches, etc.; (2) instruments indicating stable values, i.e., values that vary slowly with time, except in emergencies, and are of two kinds—adjustable values that can be regulated with the aid of knobs, and nonadjustable values indicating unalterable facts; and (3) instruments indicating unstable values, i.e., values that can be maintained by continuous action on the part of the pilot. It is assumed, in this discussion, that although the instruments function perfectly, the information received by the pilot may be "zero," "erroneous," or "imprecise." I.v.L.

N64-12319 Raytheon Co., Waltham, Mass.
PERTeach. THE DEVELOPMENT OF EXPERIMENTAL PROGRAMS FOR AUTOMATED TRAINING IN DECISION MAKING
G. J. Rath, R. E. Hannan, and M. L. Weiss L. G. Hanscom Fld., Bedford, Mass., Decision Sci. Lab., Aug. 1963 40 p refs
(Contract AF 19(628)-365)
(ESD-TDR-63-608; AD-421735)

This report discusses the concepts and techniques employed in the preparation of the programed instruction courses for training management and support personnel in PERT. The applicability of PERT to decision making is also discussed. Author

15 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gauges; sensors and transducers; and telescopes and cameras. *For related information see*: 06 Auxiliary Systems; 08 Communications; 09 Electronics; and 22 Navigation and Guidance.

N64-11474 California U., Livermore, Lawrence Radiation Lab.
A LARGE-VOLUME RADIOMETRIC CALORIMETER
Stuart R. Gunn 1 Oct. 1963 12 p refs
(Contract W-7405-eng-48)
(UCRL-7490) OTS: $0.50

An isothermal heat-flow calorimeter with a sample chamber of 13-in. diameter and 14-in. length is described. The detection limit is about 1 mw and the precision for large samples is within a few tenths of a percent. A 96-junction thermopile is used for the temperature measurement. Author

N64-11635 Deutschen Versuchsanstalt für Luft- und Raumfahrt, Berlin (W. Germany) Inst. für Turbulenzforschung
APPLICATION OF A CONTROL TECHNIQUE TO THE DEVELOPMENT OF A CONSTANT TEMPERATURE HOT-WIRE ANEMOMETER, PART 2 [ANWENDUNG DER REGELTECHNIK BEI DER ENTWICKLUNG EINES KONSTANT-TEMPERATUR-HITZDRAHTANEMOMETERS, TEIL II]
Eberhard Berger, Peter Freymuth and Eberhard Froebel Aug. 1963 42 p refs In GERMAN
(DVL-283)

The hot wire anemometer consists of a measuring probe, with the hot wire as the sensitive element, and the necessary electronic equipment which are enclosed in a housing measuring 400 x 200/90 x 250 mm. The hot wire of the measuring probe is heated to constant temperature, i.e., constant resistance, by the current from a variable-gain amplifier. The hot wire is a component of the bridge circuit. Each deviation from the theoretical value of the resistance results in an unbalancing of the bridge. The output current of the variable-gain amplifier is instantly so changed by this voltage that the hot wire regains its theoretical resistance value. The voltage drop on the bridge, due to the wire current, is a measurement for the flow velocity on the measuring probe. The bridge voltage corresponds to King's formula combined with the flow velocity. The bridge voltage in the intermediate amplifier is increased, and linearizing steps are added in order to maintain a linear relationship between flow velocity and output voltage. Also, square-wave tests are discussed. I.v.L.

N64-11735 Argentina. Comision Nacional de Energia Atomica, Buenos Aires
DIRECT CURRENT AMPLIFIER [AMPLIFICADOR DE CORRIENTE CONTINUA]
Carlos Marazzi 1963 11 p refs In SPANISH
(*Its* Informe No. 92)

In the present work a description is given of a direct current amplifier whose gate is a solid-state chopper. This amplifier can be used in control circuits, and general applications are for measurement of temperature in thermocouples, or as an amplifier for a photosensitive element. The gate impedance is relatively low, serving principally as a current amplifier. It has been tried, whenever possible, to obtain a symmetrical characteristic of positive and negative values of the potential of the gate with respect to the exit. Transl. by R.T.K.

N64-11745 Naval Ordnance Lab., White Oak, Md.
PRELIMINARY DESIGN AND PERFORMANCE STUDIES OF AN ALKALI METAL VAPOR ARC TUNNEL
J. E. Fontenot, D. Levine, and E. H. Winkler Nov. 1963 21 p refs
(NOLTR-63-105; *Its* Ballistics Res. Rept. 101; AD-423509)

The preliminary design and performance of a metal vapor arc tunnel are described. This facility is being developed to study fundamental collisional processes leading to ionization and electronic excitation in gases behind strong shockwaves. Alkali metals will be used in these studies. The present preliminary design and performance evaluation was done with mercury. Utilizing and extending the principle of the Gerdian-type arc, a system is being developed in which the liquid metal is used as electrode material as well as in an arc constricting device, so that all electrode-introduced impurity problems are eliminated. Author

N64-11753 Aerospace Medical Div., Aerospace Medical Research Lab. (6570th) Wright-Patterson AFB, Ohio
PROPOSED CRITERIA FOR ACOUSTICAL PERFORMANCE OF NOISE SUPPRESSORS
Lothar O. Hoeft, Nov. 1962 32 p refs
(AMRL-Memo-M-16; AD-292702)

During the development of noise suppressors, comparison of the acoustical performance of different noise suppressors is desirable. A method of classifying the gross acoustical performance of noise suppressors is desired for use in such comparisons. This report presents and evaluates such a classification method. This criterion gives an acoustical "figure of merit" and is useful for comparing and talking about noise suppressors. Author

N64-11876 France. Ministére de l'Air, Paris
THEORY AND APPLICATION OF EQUIPMENT FOR RECORDING BROADBAND LONG WAVES BY THE LOGARITHMIC CHARACTERISTIC [ETUDE ET REALISATION D'UN EQUIPMENT D'ENREGISTREMENT LARGE BANDE EN ONDES LONGUES, A CARACTERISTIQUE LOGARITHMIQUE]
Claude Goutelard Paris, Serv. et d'Inform. Tech. de l'Aeron. (SDIT), Sep. 1963 124 p refs In FRENCH
(*Its* Publ. Sci. et Tech. 399) Available from SDIT, 2, Ave. de la Porte-d'Issy, Paris (15e)

An apparatus for precise analysis of natural electromagnetic perturbations has been developed. The spectra and dynamics of these signals are such that it was necessary to provide, over a broadband of frequency, logarithmic amplifiers having high quality performance. The unpredictable occurrence of electromagnetic phenomena made necessary the addition of inhibiting and releasing equipment. The entire system constitutes a measuring device that can be extended to the study of numerous transitory phenomena having uncertain characteristics. Trans. by M.P.G.

N64-11914 Army Missile Command, Huntsville, Ala.
CONCERNING ERRORS IN THE READINGS OF THERMOCOUPLES PASSING THROUGH A FLAME
A. A. Zenin 7 Dec. 1962 11 p refs Transl. into ENGLISH of an article from Inzhenerno-Fiz. Zhur., (Moscow), v. 5, no. 5, May 1962 p 68–74
(AMC-Transl.-42-62)

The problem of heat transfer of a thermocouple to a gaseous medium is solved during passage of a thermocouple, at a constant speed, through a flame with an exponential temperature front. A formula is given for estimating the inadequacy of the temperature measured by a thermocouple due to its heat inertia and heat losses at its ends. Author

N64-11923 Joint Publications Research Service, Washington, D.C.
ALL-UNION CONFERENCES ON ELECTRON MICROSCOPY AND NONDESTRUCTIVE METHODS OF TESTING
Ye. Ye. Levin and V. M. Lukyanovich 24 Dec. 1963 8 p Transl. into ENGLISH of 2 articles from Zavodsk. Lab., no. 10, 1963 p 1276–1278
(JPRS-22443; OTS-64-21112) OTS: $0.50

Excerpts from reports on electron microscopy and nondestructive testing are presented. These excerpts include: (1) the use of the electron microscope in the study of the dislocation structure of metals, deformation processes, and the fine characteristics of the structural transformations during hot-working; and (2) X-ray and gamma-ray flaw detection, ultrasonic flaw detection, magnetic flaw detection, and luminescent flaw detection. I.v.L.

N64-11948 General Electric Co., Cincinnati, Ohio
REACTOR INSTRUMENTATION AND CONTROL Progress Report, [1 Sep.–31 Oct. 1963]
30 Nov. 1963 27 p refs
(Contract AT(40-1)-2847)
(GEMP-80) OTS: $0.50

Developments in the following areas are included: (1) capacitance temperature sensor—testing of beryllia and thoria dielectric specimens in the 1649° to 2204° C, the use of a transistorized oscillator to increase the maximum operating temperature to 2082° C, continued refinement of the 1649° C probe and readout system, and the fabrication of a molybdenum–beryllia vacuum-sealed probe; (2) high-temperature extension of conventional nuclear sensors—testing of fission-counter components to 816° C, and fabrication of parts for testing of dc ionization chambers to 649° C; and (3) development of nuclear sensors—modification of two gamma-compensated ionization chambers for use in the alternating-current mode of operation, and irradiation testing of charged-fragment neutron detectors under X-rays, gamma rays, and thermal neutron flux. R.T.K.

N64-11951* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
CALIBRATION OF A FISSION GAS MONITOR
Walter C. Day and Robert F. Selden Repr. from Health Phys., v. 9, 1963 p 921–925 refs

A method for calibrating beta-sensitive gas-monitoring equipment is presented, which avoids precise mixing of concentrated active gases with diluent air. This method depends upon neutron activation of the argon in P-10 proportional counting gas, and passage of the active gas successively through the monitor chamber and a proportional counter chamber. The latter serves for the determination of specific activity of the monitor gas. The method is satisfactory for specific activities corresponding approximately to maximum permissible concentration (MPC) levels. Author

N64-11953 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.
CALIBRATION OF AN ELECTRONIC COUNTER AND PULSE HEIGHT ANALYZER FOR PLOTTING ERYTHROCYTE VOLUME SPECTRA
Jess M. Mc Kenzie, P. R. Fowler and P. J. Lyne Mar. 1963 12 p refs
(CARI-63-8)

A simple technique is presented for calibrating an electronic system used in the plotting of erythrocyte volume spectra. The calibration factors, once obtained, apparently remain applicable for some time. Precise estimates of calibration factors appear to be limited by errors in measuring hematocrit and/or mean channel. For consistent determination of the latter, the selection of a sufficiently low aperture current appears to be of importance. Author

N64-12006 Aerospace Corp., El Segundo, Calif. Plasma Research Lab.
CONSTRUCTION AND CALIBRATION TECHNIQUES OF HIGH FREQUENCY MAGNETIC PROBES
R. C. Phillips and E. B. Turner 18 Nov. 1963 26 p refs
(ATN-64(9231)-2)

A discussion is given of the details involved in the construction and calibration of high-frequency magnetic probes used to investigate transient magnetic fields encountered in a magnetohydrodynamic experiment. A simple and reliable calibration system up to 50 Mc using available laboratory electronic equipment is explained. Because Helmholtz coils are used to produce the calibrating field, the parameters for the Helmholtz coils, as well as approximate values observed for the induced probe voltage and the current fed to the Helmholtz coils, are given. Also, probable sources of error involved in the calibration of the magnetic probes are discussed. Several graphs of attenuation vs frequency are given for probes of different construction and the factors affecting these response curves. The design and construction of a double probe together with its frequency response curve is given. Author

N64-12020 Army Electronics Research and Development Lab., Fort Monmouth, N.J.
THE MEASUREMENT OF HIGH INTENSITY GAMMA FLUXES WITH VAC ION GAUGES
Basil Markow Mar. 1963 15 p refs
(USAELRDL TR-2342; AD-419802)

The need for a readily available gamma detector, capable of measuring the highly intense and rapidly changing fluxes of pulse sources, is filled with the use of a commercially available off-the-shelf item, the vac ion gage, and an easily constructed cable connector. Author

N64-12042 Franklin Inst., Philadelphia, Pa.
STUDY OF ELECTROMAGNETIC TECHNIQUES FOR SPACE NAVIGATION Final Report, 15 Apr. 1960-15 Aug. 1963
R. G. Franklin, R. H. Field, W. C. Reisener, Jr., and D. L. Birx Wright-Patterson AFB, Ohio, AF Avionics Lab., Oct. 1963 142 p refs
(Contract AF 33(616)-7244)
(F-A2415; RTD-TDR-63-4047; AD-422552)

A series of experiments has been conducted to investigate the application of template spectroscopy techniques to the problem of measuring the velocity of space vehicles, with respect to natural sources of radiation. A Bausch and Lomb spectrograph was first used with the sun as a source and a template vibrating at 10 cps to provide ac detection of the match point. It was found that hand engraved templates with narrow lines 20μ in width gave best results because of the extreme contrast obtainable. The measurement uncertainty of this instrument, which was noise limited, averaged 164 m/sec. A second spectrograph, designed to be used with a 24-in. telescope for similar work with stellar sources, was also constructed. This instrument uses a 500 cps template vibrator in an attempt to eliminate atmospheric noise. The noise level with the stellar spectrograph using the sun as the source is reduced to approximately 60 m/sec. The accuracy of measurement is poorer than this, however, because of a random wander in the match point apparently associated with the 500 cps vibrator. Author

N64-12048 Air Force Cambridge Research Labs., Bedford, Mass. Geophysics Research Directorate
MOIRE FRINGE MEASURING SYSTEM FOR FAR INFRARED INTERFEROMETRIC SPECTROMETER
E. V. Loewenstein Oct. 1963 11 p refs
(*Its* Instrumentation for Geophys. and Astrophys. 32; AFCRL-63-735; AD-424950)

The system uses a grating of 10μ spacing and gives a passage of one fringe for each 5μ of motion by means of an optical setup originally described by Palmer. A modification of Palmer's system, which utilizes the broad fringes produced with the relatively coarse grating, is described. Author

N64-12063 Princeton U., N. J. Plasma Physics Lab.
DIFFERENCES BETWEEN NUDE AND ENCLOSED ION GAUGES ON AN OIL-FREE SYSTEM
Edward Apgar Aug. 1963 29 p
(Contract AT(30-1)-1238)
(MATT-212)

High-conductance "nude" gages and low-conductance glass-enclosed "tubulation" ion gages were compared on an oil-free all-metal, bakeable, ultrahigh vacuum system over the pressure range of 10^{-10} torr to 10^{-5} torr. Large differences in pressure indication were observed with CO, the tubulation gage reading consistently less than the nude gage. Smaller differences in the same direction occurred with H_2 and N_2 and none with He. Heating the tubulation or maintaining the pressure above 10^{-7} torr reduced the differences. An explanation is offered in terms of adsorption in the tubulation, and a low effective conductance. Author

N64-12070* Aeronutronic, New Beach, Calif.
DEVELOPMENT AND FABRICATION OF OMNI-DIRECTIONAL ACCELEROMETERS Final Report
C. F. Husen and R. G. Mc Clellan 19 Jul. 1963 146 p refs
(NASA Contract NAS7-100)
(NASA CR-55091; Publ. U-2189) OTS: $11.00 ph, $4.58 mf

Design objectives of acceleration range, overload capacity, thermal compensation, sterilization capability, and maximum dimensions were basically met or exceeded. The omnidirectional accelerometers quite closely duplicated the acceleration traces of the reference Endevco unidirectional accelerometer in drop tests at up to 2000 g's. The accelerometers were very closely reproducible under each particular test condition, and good linearity was realized in both static pressure calibration and shock testing up to 2000 g's, though there was generally some offset between static and dynamic test data. Eight of the accelerometers have an accuracy of approximately ±10 percent of full range under all conditions tested. Author

N64-12074 North American Aviation, Inc., Los Angeles, Calif.
CATHODE-RAY TUBE INSTRUMENT SYNTHESIS SYSTEM Technical Report [Feb. 1961-Sep. 1962]
R. N. Winner and A. Zilgalvis Wright-Patterson AFB, Ohio, Behavioral Sciences Lab., Oct. 1963 52 p
(Contract AF 33(616)-7859)
(AMRL-TDR-63-84; AD-424542) OTS: $1.50

A design study was conducted leading to development of a flexible laboratory design tool for synthesizing and analyzing cockpit displays. The resulting cathode-ray tube instrument synthesis system (CRT-ISS) is compatible with standard analog computer systems and has a self-contained provision for generation of 50 alpha-numeric and geometric symbols, each of which can be displayed by any or all of the 64 time-shared display channels. In addition, the size, static vertical and horizontal positioning, and intensity of each symbol displayed can be independently controlled for each of the 64 channels. The preprograming of the display is accomplished by patch cord plugging and adjustment of potentiometers. The output of the system consists of X-, Y-, and Z-axes signals which permit driving conventional cathode-ray tube oscilloscopes singly, in multiples, or in various combination. Author

N64-12171 Aerojet-General Corp., Sacramento, Calif.
WEAPON SYSTEM 133A: QUALIFICATION-TEST REPORT ON STATHAM DIFFERENTIAL PRESSURE TRANSDUCER Final Report
R. W. Armstrong 14 Oct. 1963 36 p
(Contract AF 33(600)-36610)
(Rept. 0162-01DR-24; AD-421712)

The Statham 3-psi-differential pressure transducer meets Minuteman requirements. Data obtained from the qualification tests of the 5-psi-absolute pressure transducer are applicable to the 3-psi-differential pressure transducer on the basis of similarity of materials, components, and manufacturing processes of the two units. Author

N64-12210 Radio Corp., of America, Camden, N.J.
A FIBER OPTIC SENSING DEVICE Final Report
Griffiss AFB, N.Y., Inform. Process. Lab., Oct. 1963 59 p refs
(Contract AF 30(602)-2802)
(RADC-TDR-63-438; AD-424987)

The report describes a fiber optic device which has optical inputs and analog current outputs. Fiber optics were used in order to preserve the analog nature of the input patterns. The device as built will be used as an optical input device for the analog learning machine under construction at Rome Air Development Center. Author

N64-12221 Army Missile Command, Huntsville, Ala.
A METHOD FOR MINIMIZING THE EFFECT OF THE PERSHING ST-120 SERVO BOX INTERCHANGE ON CROSS RANGE ACCELEROMETER DRIFT
H. V. White and H. R. McCarley 9 Sep. 1963 15 p
(RG-TR-63-24; AD-422778)

The report presents a method to allow the PERSHING ST-120 servo box to be interchanged without readjusting the accelerometer amplifier balance potentiometer. The method involves adjusting the balance potentiometer with the servo box removed from the system and making a final mechanical adjustment on the accelerometer after it is mounted on the ST-120 platform. Test data are presented to show the feasibility of using the method. Author

N64-12237 Motorola, Inc., Phoenix, Ariz. Semiconductor Products Div.
EPITAXIAL CONTROL SYSTEM Scientific Report No. 4
Don M. Jackson, Jr. 14 Jun. 1963 27 p
(Contract AF 19(604)-8351)
(AFCRL 63-350; AD-422357)

The operation of the vapor analysis system, employing a small, highly sensitive mass spectrometer to analyze the components of the gas stream to a silicon epitaxial reactor, has been much improved. The addition of a higher field strength sector field magnet has improved the spectrometer resolution. New electrometers have improved the response time and sensitivity of the system. It now appears feasible to directly monitor the growth and doping of silicon epitaxial layers of resistivities as high as one ohm-cm. Author

N64-12271 Aerospace Corp., El Segundo, Calif.
ASPECTS OF RECORDING SYNTHETIC ARRAY DATA Communications Systems Technical Report No. 2
C. S. Lorens 1 Sep. 1963 54 p refs
(Contract AF 04(695)-269)
(SSD-TDR-63-224; TDR-269(4305)-3; AD-423931)

The size and resolution of the desired map play a direct role in specifying the recording requirements of synthetic array data. A detailed investigation of the system indicates the required bandwidths, demodulations, and stabilities of intermediate processing that are required. Several approaches are presented, with a corresponding analysis, to indicate the consequences of their assumptions and the theoretical bounds on their operation. Author

N64-12284 Air Force Cambridge Research Labs., Bedford, Mass.
THE OMEGATRON VERSUS A SECTOR-TYPE MASS SPECTROMETER FOR RESIDUAL GAS STUDIES
J. H. Bloom, C. E. Ludington, and R. L. Phipps Oct. 1963 19 p refs Presented at the 2nd Intern. Symp. on Residual Gases in Electron Tubes, Milan, 12–15 Mar. 1963
(AFCRL-63-386; AD-424732)

Work has been reported on the use of the omegatron mass spectrometer as a residual gas analyzer capable of measuring partial pressures in the 10^{-11} torr range. When an ultimate limit of at least 10^{-13} torr was announced for a sector-type mass spectrometer with an electron multiplier, it was thought that a comparison of these two instruments would give considerable insight as to what effect each had on the vacuum ambient. A laboratory ultrahigh-vacuum system was modified to include both types of partial pressure analyzers so that each read the same ambient. Dynamic and static tests were made with selected pure gases while operating the analyzers individually and concurrently. The sensitivity, resolution, pressure ranges, fragment patterns, and the effect of each mass spectrometer on the ambient are discussed in detail. Conclusions denote specific advantages of both instruments. Author

N64-12320 Stanford U., Calif.
A TRAVERSING PROBE FOR PITOT-PRESSURE MAPPING IN A HYPERSONIC TUNNEL Technical Report No. 1
B. T. Alligood, J. B. Kyser and D. W. Tsao Sep. 1963 41 p refs
(Contract Nonr-225(65); Proj. Defender)
(SUDAER-170; AD-423947)

An account is given of the design, construction, and operation of a multiprobed axially traversing pitot-pressure rake, which was designed to measure wake pressure profiles behind models in the Stanford spark-heated wind tunnel. Criteria considered in the design of the traversing probe are discussed. The mechanical operation of the probe during bench tests and during initial experiments in the tunnel is described, and velocity-time diagrams are given. Examples of the pressure data that have been taken in the wake behind a cylindrical model are presented and discussed briefly. Author

N64-12351* Space Technology Labs., Inc., Redondo Beach, Calif.
INSTRUMENTATION FOR A MINERALOGICAL SATELLITE
Eugene A. Burns and R. J. P. Lyon (Stanford Res. Inst.) [1963] 26 p refs Presented at the 14th Intern. Astronautical Congr., Paris, 25 Sep.–1 Oct. 1963
(Partially supported by NASA)
(IAC Paper 94; Rept. 9990-6459-RU-00)

The theoretical basis, operational considerations, instrumental constraints, feasibility, and application of a mineralogical satellite are discussed. From the discussion, it is concluded that the remote infrared spectral measurement of the lunar surface will provide valuable information for mineralogical and temperature mapping; it may also introduce a method to determine the general particulate structure. Instrumentation for such a satellite exists in state-of-the-art hardware and detection techniques. The extension of this concept to other planets is limited only by the atmospheric absorption of infrared energy. P.V.E.

N64-12367 Army Missile Command, Huntsville, Ala.
A REVIEW OF THE STATE-OF-THE-ART IN MILLIMETER TECHNOLOGY
A. H. Green, Jr. 18 Sep. 1963 26 p refs
(RE-TR-63-30)

The purpose of this report is to relate the present state-of-the-art knowledge in millimeter wave technology with regard to three primary subjects: (1) transmission methods; (2) power sources; and (3) signal detection. This report discusses each subject in some detail. It is concluded that only transmission methods are at an advanced technical level, while power sources and signal detectors require further research and development. Author

N64-12369 Sperry Microwave Electronics Co., Clearwater, Fla.
DEVELOPMENT OF ADVANCED MICROWAVE COMPONENTS AND TECHNIQUES – PLANAR HEXAGONAL FERRITES AND DEVICES
Joseph Schenna Griffiss AFB, N.Y., Techniques Lab., Sep. 1963 25 p refs
(Contract AF 30(602)-2757 FSC-AO82)
(RADC-TDR-63-385; AD-422600)

A series of Y compounds was selected as potentially offering a suitable range of anisotropy fields and line widths for the device studies contemplated. Within this series the iron stoichiometry was varied to determine its effect on dielectric loss tangent. Also in this series, a partial substitution of aluminum for iron was made to observe its effect on the saturation magnetization of the end product. The first ten batches so prepared showed abnormally high dielectric loss tangents. This excessive loss is believed to be due to a loss of barium in the preparation process, and tended to override any effects due to varying iron stoichiometry. Best combinations of alignment and low loss tangents were obtained in materials prepared with ethyl alcohol as a carrier. Alignment factors as high as 0.99 have been achieved on materials having loss tangents of the order of 0.015. There is evidence to indicate that these loss tangents could be further reduced by lowering the firing temperature of the materials. Author

N64-12397* Barnes Engineering Co., Stamford, Conn.
INFRA-RED AND ELECTRO-OPTICS PHASE 1: LUNAR AND PLANETARY HORIZON SENSOR Final Technical Report
Monty M. Merlen 25 Jun. 1963 128 p refs
(NASA Contract NAS7-100; JPL Contract 950470)
(NASA CR-55106; BEC-4290-FR1) OTS: $10.10 ph, $4.04 mf

The final status of the program to define optical, mechanical, electronic, and detector parameters of the lunar and planetary horizon sensor, in accordance with JPL specification 2960, is presented. I.v.L.

16 LIFE SCIENCES

Includes biology; exobiology; physiology; medicine; life support systems; radiation effects on biological systems; and space sickness. *For related information see*: 14 Human Behavior; and 28 Space Radiation.

N64-11439 Air Force Systems Command, Wright-Patterson AFB, Ohio Behavioral Sci. Lab.
INFORMATION THEORY AND HUMAN BEHAVIOR: UNCERTAINTY AS A FUNDAMENTAL VARIABLE IN INFORMATION-PROCESSING TASKS [Dec. 1, 1961-Aug. 24, 1962]
Karl L. Wiegand (Ph.D Thesis) Oct. 1963 103 p refs
(Contract AF 33(616)-7122)
(AMRL-TDR-63-89; AD-403485)

Three studies were performed to investigate the relationship between (1) stimulus uncertainty and simple reaction time, (2) joint stimulus-response uncertainty and choice reaction time, and (3) uncertainty in a complex information transformation task and reaction time. A linear relationship was found in each case. The mean reaction time for performing the transformation task could be predicted remarkably well using the rate of information transmission obtained in the choice reaction time task. Author

N64-11445 Aerojet-General Corp., Azusa, Calif.
A STUDY OF THE EFFECTS OF LONG-TERM INGESTION OF RECOVERED WATER: HUMAN INGESTION TRIALS [Nov. 1961-Apr. 1963]
D. de Steiguer and A. T. Pessa Wright-Patterson AFB, Ohio, Biomedical Lab. Oct. 1963 27 p refs
(Contract AF 33(616)-8196)
(AMRL-TDR-63-70; AD-424132) OTS: $0.75

This work was conducted to obtain subjective responses to recycled water recovered from urine, laboratory data on the recovery procedures, and clinical data to indicate any pathophysiological effects. Four male human volunteers participated; an 8-week control period, during which a minimum of 1500 cc of distilled water was consumed each day, was followed by an 8-week experimental period, during which 1500 cc/day of distillate was to be consumed. A still of standard laboratory glassware was constructed to permit recovery of large percentages of human urine. Chemical analyses indicated that the distillate conformed to water standards established by the U.S. Public Health Service. The clinical examinations included cephalin-flocculation and thymol-turbidity tests, complete blood counts, and urinalyses. None of the subjects demonstrated psychologic or physiologic symptoms. Author

N64-11461 Farr Cytochemical Labs., Camden, Maine
RESEARCH ON THE CYTOCHEMISTRY OF MICROORGANISMS [Final Report, Feb. 1962-Feb. 1963]
Wanda K. Farr Wright-Patterson AFB, Ohio, Biomedical Lab., Aug. 1963 51 p refs
(Contract AF 33(616)-7891)
(AMRL-TDR-63-72; AD-423528)

Cell wall substances in the alga, *Chlorella pyrenoidosa* 71105 and the fungus, *Linderina pennispora* NRRL 2237 have been identified and localized by means of standard cytochemical techniques. Pectic material in the primary lamella and cellulose in the secondary lamella have been found in the wall of *C. pyrenoidosa*. The walls of the cells of *L. pennispora* are chitinous, with no indication of the presence of cellulose at any stage of development. The pectic material in the wall of the alga is in the form of a pectic-protein complex, and the chitin in the walls of the fungal cells is in the form of a chitin-protein complex. The wall of *C. pyrenoidosa* reacts positively to an enzyme mixture of pectinase and cellulase, and the walls of *L. pennispora* react similarly to chitinase. These identifications and reactions to enzymes can be used in the effort to bring about total assimilation of cell wall substances if these algal and fungal cells should be chosen as food materials in meeting the nutritional requirements of the space program. Author

N64-11516* National Aeronautics and Space Administration, Washington, D.C.
WHAT DOES THE SPACE PROGRAM REVEAL ABOUT HUMAN ENGINEERING AND MEDICAL RESEARCH?
Eugene B. Konecci *In its* Conf. on Space, Sci., and Urban Life, Oakland, Calif., Mar. 28–30, 1963 p 145–157 (See N64-11502 03-01) GPO: $1.75

The importance of establishing requirements for the development of an adequate life support system and protective system for man's survival in the space environment was pointed out. The program must include the study of man, man–machine, and man–systems. The study of man results in the setting of physiological and mental limits necessary to establish the requirements for man's equipment and habitability. The next area, man–machine (biotechnology), results from the parameters

imposed by the man area and includes life support systems, protective systems, and man–machine control. Finally, man and the equipment designed according to man's requirements are integrated into the man–systems area. C.L.W.

N64-11524 Joint Publications Research Service, Washington, D.C.
MOBILITY OF NERVOUS PROCESSES IN DOGS OF DIFFERENT AGES IRRADIATED ANTENATALLY WITH IONIZING RADIATION
H. G. Ayrapetyanta *In its* Transl. from Zhur. Vysshey Nervnoy Deyatel'nosti im. I. P. Pavlov 12 Feb. 1963 p 25–38 refs (See N64-11521 03-01) OTS: $1.00

An investigation was made of the adaptability of nerve processes of prenatally irradiated dogs. Gravid females were subjected to whole-body irradiation with a dose of 200 r on the 20th day of pregnancy. The study of the adaptability of the nerve processes was begun in two-month-old puppies. The method used was that of bilateral revision of the signal significance of an associated pair of conditioned stimuli. Results indicate that with ionizing radiation in a dose of 200 r, adaptability, as judged by ability to learn a revision of signal significance, was impaired. Reduction of the adaptability of the nerve processes was established as early as two months and was still evident at a later age. Pathological lability of the excitatory process was also noted. R.T.K.

N64-11533 Joint Publications Research Service, Washington, D.C.
SOME QUESTIONS THAT DETERMINE THE DEVELOPMENT OF CYBERNETICS
V. M. Glushkov *In its* Translations from Avtomatyka (Automation), v. 7, no. 3, 1962 18 Feb. 1963 p 54–63 (See N64-11529 03-01) OTS: $2.25

The role of general-purpose digital computers in the progress of cybernetics is discussed. R.T.K.

N64-11534 Joint Publications Research Service, Washington, D.C.
ANALYSIS OF PERCEPTRONS
S. F. Kozubovs'kyy *In its* Translations from Avtomatyka (Automation), v. 7, no. 3, 1962 18 Feb. 1963 p 64–78 refs (See N64-11529 03-01) OTS: $2.25

An explanation is presented of the structure and uses of perceptrons. Simple perceptrons and sequentially-functioning perceptrons with four series of elements are discussed. R.T.K.

N64-11535 Joint Publications Research Service, Washington, D.C.
SUMMARY OF THE DIRECTIONS OF CYBERNETIC DEVELOPMENT
In its Translations from Avtomatyka (Automation), v. 7, no. 3, 1962 18 Feb. 1963 p 79 (See N64-11529 03-01) OTS: $2.25

The following topics are discussed: (1) general-purpose digital computers and "biological-type" computer systems; (2) self-organization systems; and (3) "macro" and "micro" systems of automation. R.T.K.

N64-11564* National Aeronautics and Space Administration, Washington, D.C.
EFFECT OF A CONSTANT MAGNETIC FIELD ON CONDITIONED REFLEXES IN A SEA FISH [O VLIYANII POSTOYANNOGO MAGNITNOGO POLYA NA USLOVNYYE REFLEKSY U MORSKIKH RYB]
Yu. A. Kholodov and G. L. Verevkina Dec. 1963 14 p refs Transl. into ENGLISH of an article from Biol. Belogo Morya (USSR), v. 1, 1962 p 248–255
(NASA TT F-189) OTS: $0.50

The object of the study was to clarify the possible effect of a constant magnetic field on conditioned reflexes in fish. The experiments were performed on threespine sticklebacks, flounder, and fourhorn sculpins. These fish were selected because they were small enough to insert in the solenoid used to set up the relatively homogeneous magnetic field employed in the experiments. The theory that in their long-range migrations fish orient themselves according to the earth's magnetic field also influenced the choice of subjects. Author

N64-11607 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM MEDITSINSKAYA RADIOLOGIYA (MEDICAL RADIOLOGY) [MOSCOW] NO. 12, 1962
V. I. Shevchenko et al 15 Feb. 1963 38 p refs Transl. into ENGLISH of 2 articles p 49–55 and 68–77
(JPRS-17659; OTS-63-21141) OTS: $1.00

CONTENTS:
1. CHARACTERISTICS OF DISTURBANCES OF THE BLOOD COAGULATION SYSTEM IN CHRONIC (OCCUPATIONAL) X-RAY IRRADIATION V. I. Shevchenko p 1–11 refs (See N64-11608 03-16)
2. EFFECT OF PROLONGED AND REPEATED IRRADIATIONS ON THE BLOOD AND HEMOPOIETIC ORGANS G. D. Baysogolov p 12–36 refs (See N64-11609 03-16)

N64-11608 Joint Publications Research Service, Washington, D.C.
CHARACTERISTICS OF DISTURBANCES OF THE BLOOD COAGULATION SYSTEM IN CHRONIC (OCCUPATIONAL) X-RAY IRRADIATION
V. I. Shevchenko *In its* Transl. from Med. Radiol. [Moscow] no. 12, 1962 15 Feb. 1963 p 1–11 refs (See N64-11607 03-16)

Marked disturbances of the blood coagulating system are elicited simultaneously with the subclinical manifestations of radiation effects in people who are exposed to X-rays in offices. The most regular manifestations were: prolongation of recalcification time, reduction of prothrombin consumption, as well as of the activity of plasmic prothrombin factors, and the impairment of thromboplastic formation. Less pronounced were: reduction of serotonin, of proaccelerin, of proco vertin, of prothrombin time, and of heparin tolerance. Retraction of the blood clot and free heparin of the blood showed no change. Prolonged rest and complex vitamin therapy led to the attenuation or elimination of clinical manifestations and to an improvement of the blood coagulation indices. Thus, although disturbances of blood coagulation following occupational radiation action are regular and sufficiently stable, they are nevertheless reversible. I.v.L.

N64-11609 Joint Publications Research Service, Washington, D.C.
EFFECT OF PROLONGED AND REPEATED IRRADIATIONS ON THE BLOOD AND HEMOPOIETIC ORGANS
G. D. Baysogolov *In its* Transl. from Med. Radiol. [Moscow] no. 12, 1962 15 Feb. 1963 p 12–36 refs (See N64-11607 03-16)

The effect of prolonged and repeated irradiations on the blood and hemopoietic organs is reviewed. Changes that take place in peripheral blood are a reflection of changes taking

place in the hemopoietic organs. Data from basically morphological investigations attest to the fact that, under the effect of ionizing radiation, destructive–regenerative processes originate from the very first in the hemopoietic organs. However, in contrast to a single irradiation with a large dose, marked regenerative processes are observed simultaneously with destructive processes, in cases of chronic exposure. An increase in the single radiation dose shows a progressive increase in blood changes. The extent of blood changes depends on the species of the experimental animals. It is indicated that a single dose of the order of one r/d, upon prolonged action, causes no distinct changes in the picture of the peripheral blood in various species of animals. However, there are available data which show that definite changes in the composition of the peripheral blood were observed in rabbits exposed for a period of 60 days to a dose of 0.5 r/d. I.v.L.

N64-11621 Joint Publications Research Service, Washington, D.C.
CURATIVE SLEEP
P. Bul' 8 Mar. 1963 13 p Transl. into ENGLISH of an article from Znanie Sila (Moscow), no. 11, Nov. 1962 p 28–30 (JPRS-18021; OTS-63-21278) OTS: $0.50

Induced sleep, particularly electrosleep, as a cure for various illnesses is discussed. Types of ailments discussed include: (1) *Chronic Insomnia*—Cure from the insomnia was complete after eight treatments with electrosleep each lasting a half hour. (2) *Bronchial Asthma*—After five sessions of electrosleep the attacks of bronchial asthma completely ceased. (3) *Ulcers*—After six treatments the patient's pains had disappeared, after the seventh session the nausea and burning disappeared, and after the thirteenth treatment the ulcer healed. Each treatment consisted of 40 minutes of sleep with the current turned on. (4) *Hypertension*—After fifteen to twenty treatments all symptoms of hypertension disappeared. P.V.E.

N64-11667* National Aeronautics and Space Administration, Washington, D.C.
PROBLEMS OF SPACE BIOLOGY
N. M. Sisakyan, O. G. Gazenko, A. M. Genin *In its* Prob. of Space Biol., Nov. 1963 p 17–27 (See N64-11665 03-01) OTS: $7.00

A brief and general discussion is presented of the effects of radiation encountered in outer space, and particularly of that associated with the lower belts of radiation surrounding the earth. Exposure to weightlessness is considered to be relatively safe; but two important points are made, namely, the need to study the effects of prolonged weightlessness on return to the gravitational field, and the effect of weightlessness on embryological development. Considerable emphasis is given to the problem of suitable diet during spaceflight. In view of the heavy weight demand of food and water, various methods of partial and complete recirculation are suggested. These include distillation ion exchange and electro-osmosis. Recirculation of oxygen is also briefly described: photolytic decomposition of carbon dioxide with hard ultraviolet in the presence of copper catalysts is suggested. Biochemical methods based on the action of anaerobic bacteria are also discussed. A number of suggestions are made regarding the synthesis of food. The article is concluded with a brief review of arguments in favor of the existence of organic life in the exosphere. Author

N64-11668* National Aeronautics and Space Administration, Washington, D.C.
RADIOBIOLOGICAL PROBLEMS OF SPACE FLIGHTS
A. A. Gyurdzhian *In its* Prob. of Space Biol., Nov. 1963 p 29–118 refs (See N64-11665 03-01) OTS: $7.00

Nearly 300 references, both Russian and Western, relating to the physical and medical aspects of spaceflight are quoted and briefly reviewed. Fundamentals of cosmic radiation, radiation belts around the earth, and interreaction of various radiations with the environment are given. The effects of ionizing radiations on tissues, and the principles of protection against cosmic radiations, are discussed. The importance of solar activity forecasts is discussed. The results of experiments exposing biological material to cosmic radiation are also discussed. Author

N64-11669* National Aeronautics and Space Administration, Washington, D.C.
PROBLEMS OF BIOLOGICAL TELEMETRY
V. V. Parin, R. M. Bayevskiy, and O. G. Gazenko *In its* Prob. of Space Biol., Nov. 1963 p 119–132 refs (See N64-11665 03-01) OTS: $7.00

The main program of the intelligence collected during spaceflight included: electrocardiogram, cardiac tone, pulse wave propagation, electroencephalogram, electromyogram, pneumogram, arterial pressure, galvanic skin reaction, various motor reflexes, skin and body temperatures, activity of gastrointestinal tract, and oxygen saturation of the blood. The methods used during the second and third satellite flights carrying dogs included: electrocardiography, phonocardiography, arterial oscillography, pneumography, actography, thermometry, electromyography and seismocardiography. Samples of the radiotelemetric recordings of the tracks from the above measurements are given. Problems connected with the transmission and channeling of the intelligence are also discussed, and it is concluded that the reduction of the channel bandwidth with simultaneous increase of transmissive power will not lower the transmissive capacity of the channel. Methods of coding the physiological information, including such systems as cardiophonic pulse transmission, single-channel three-parameter coding, and five-parameter computer-assisted coding are discussed. Author

N64-11670* National Aeronautics and Space Administration, Washington, D.C.
PROBLEMS OF SPACE MICROBIOLOGY AND CYTOLOGY
N. N. Zhukov-Verezhnikov, I. N. Mayskiy, V. I. Yazdovskiy, A. P. Pekhov, N. I. Rybakov et al *In its* Prob. of Space Biol., Nov. 1963 p 133–151 refs (See N64-11665 03-01) OTS: $7.00

Microbiological and cytological investigations carried out in the Soviet satellites Vostok-1 and Vostok-2 were intended for solving the following two problems of biology: (1) study of conditions of life in outer space (viability of microorganisms and somatic cells and reproduction after exposure); (2) study of the genetic effects caused by spaceflight. Biological material of different levels of organization was studied: bacteria, phages, cells in tissue culture (Hela cancer cells, fibroblasts, amnion cells), and skin flaps which were regrafted to their donors after flight. No essential changes were observed in comparison with controls in microbiological and cytological specimens used in the spaceflights. It assumed, therefore, that spaceflight conditions have no unfavorable effect on highly organized, multicellular organisms of more highly developed animals or living cells. Only in one experiment in Vostok-2 was a slight increase observed in the induced phage production of lysogenic bacteria. The dissociative phenomena in the culture *E. coli* KK-12 increased somewhat. Author

N64-11671* National Aeronautics and Space Administration, Washington, D.C.
THE POSSIBILITY OF EXISTENCE AND METHODS OF DETECTING EXTRATERRESTRIAL LIFE
A. A. Imshenetskiy *In its* Prob. of Space Biol., Nov. 1963 p 153–160 (See N64-11665 03-01) OTS: $7.00

The author briefly reviews past and present origin-of-life theories, and the possibility of interplanetary transport of life forms by means of radiation pressure. It is simpler in principle to suppose that life forms on other planets will resemble terrestrial unicellular organisms, rather than to postulate the existence of types of metabolism not based on water and carbon. Such organisms can withstand liquid helium temperatures, but −10° C appears to be the lower limit at which reproduction has been observed. Some thermophilic bacteria can withstand boiling for 4 to 5 days, and the author postulates that organisms could have become adapted to temperatures up to 150° C on other planets. Many lower terrestrial forms are sufficiently radioresistant to withstand the effects of cosmic radiation, but resistance to ultraviolet radiation is much lower. The absence of oxygen is, in this respect, also immaterial as many terrestrial organisms can grow under anaerobic conditions. The author discusses various methods proposed for automatically recording the existence of life forms, from a vehicle which has landed on a planet. Author

N64-11672* National Aeronautics and Space Administration, Washington, D.C.

ON THE PROBLEM OF SUPPLYING THE CREWS OF SPACESHIPS WITH ANIMAL FOODSTUFFS

K. S. Akhlebininskiy, V. P. Bychkov, I. A. Il'ina, Yu. I. Kondrat'yev and A. S. Ushakov *In its* Prob. of Space Biol., Nov. 1963 p 161–168 refs (See N64-11665 03-01) OTS: $7.00

The most realistic way to provide spaceship crews with food of animal origin is to carry and raise, in these spaceships, higher-order animals which have been thoroughly studied from the zoological, physiological, and nutritional point of view (for instance, poultry, rabbits, etc). Chickens are suggested, in particular, since they can be fed on algae and food wastes, including chicken entrails, and require little space. Author

N64-11673* National Aeronautics and Space Administration, Washington, D.C.

BIOCHEMICAL INVESTIGATIONS OF THE BLOOD AND URINE OF ANIMALS THAT FLEW IN SATELLITES

A. A. Gyurdzhian, N. N. Demin, L. T. Tutochkina, M. S. Uspenskaya, and T. A. Federova *In its* Prob. of Space Biol., Nov. 1963 p 169–178 refs (See N64-11665 03-01) OTS: $7.00

The studies included determination of: (1) the protein composition of blood and its nonspecific cholinesterase activity, and (2) the amount of 21-oxy-20-ketocorticosteroids and intermediates of nucleic acid metabolism (deoxicytidine and Dische-positive substances) contained in urine. Dogs were studied under laboratory conditions and on board the Soviet satellites 2, 4, and 5. After a single period of acceleration or vibration under conditions similar to those pertaining to flights, relatively short-term changes were found to exist, the changes indicating an activation of the functions of the liver and other systems, i.e., an increase in the nonspecific cholinesterase activity, and a decrease in the concentration of serum mucoids in blood. Due to prolonged training, tests, rocket flights, and examinations, some dogs developed a state of dystrophia characterized by a stable rise of serum mucoids and α_2-globulin concentration in blood and by a reduction of the total amount of protein at the expense of the albumin fraction. It is concluded that the biochemical changes observed after the flight are more likely to be due to stress reactions than to ionizing radiation. Author

N64-11674* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN CERTAIN MORPHOLOGICAL AND BIOCHEMICAL INDICES OF THE PERIPHERAL BLOOD OF ANIMALS AFTER ROCKET FLIGHTS

I. I. Kas'yan, Ye. M. Yuganov, and T. S. L'vova *In its* Prob. of Space Biol., Nov. 1963 p 179–183 refs (See N64-11665 03-01) OTS: $7.00

Blood counts and blood biochemical determinations were carried out on 12 dogs which had undergone 2 to 5 spaceflights. Blood samples were taken on the eve of the flight, 1 1/2 to 2 1/2 hours after landing, and also at later stages. Forty-two investigations were carried out in all. After the flight, an increase in the white-cell count of 1,800 to 11,050 cells per mm^3 was noted, due mainly to an increase in neutrophils, with a shift to the left of up to 30 percent of unsegmented forms. These changes were ascribed to a redistribution of cells from depot organs under the influence of mechanical forces, although a stress reaction may also have been concerned. No changes were noted in the red-cell count, but, after the spaceflight, there was a reduction in clotting time, with an increase in the calcium and prothrombin levels and a slight rise in the platelet count. Author

N64-11675* National Aeronautics and Space Administration, Washington, D.C.

RESULTS OF INVESTIGATIONS OF SOME INDICES OF THE PERIPHERAL VESSELS IN DOGS DURING AND AFTER SPACE FLIGHT

V. V. Yakovlev *In its* Prob. of Space Biol., Nov. 1963 p 185–189 refs (See N64-11665 03-01) OTS: $7.00

Maximum arterial pressure, venous pressure, arterial and venous tone, and the blood stream rate in the peripheral blood vessels (of ears) of dogs have been measured by a universal manometer. Data obtained during spaceflights in rockets and satellites indicate that venous pressure increased during overloads, but, during the weightless period, both venous and arterial pressure were normal. Shifts in arterial and venous tone and the blood stream rate were not significant. Author

N64-11676* National Aeronautics and Space Administration, Washington, D.C.

OBSERVATIONS ON THE CONDITIONED REFLEX ACTIVITY OF WHITE RATS SOME CONSIDERABLE TIME AFTER TRAVELLING ON THE SECOND SOVIET SATELLITE

L. D. Luk'yanova *In its* Prob. of Space Biol., Nov. 1963 p 191–200 refs (See N64-11665 03-01) OTS: $7.00

The combined effect of various spaceflight factors on the higher nervous activity was investigated on seven male albino rats, of which two participated in the flight and five served as controls. A stereotype of six positive and one differentiated motor-alimentary conditioned reflexes from optical and acoustic analyzers was produced in all the animals; the composition of the peripheral blood, the weight and the general state were determined and the data were used for statistical processing. For 2 1/2 months after the flight no changes could be detected in the higher nervous activity of the rats studied; they were only slightly different from those of the controls. It is concluded that the animals withstood satisfactorily the conditions of spaceflight. Author

N64-11677* National Aeronautics and Space Administration, Washington, D.C.

INFLUENCE OF SPACE-FLIGHT FACTORS ON THE BACTERICIDAL ACTIVITY OF THE BODY

O. G. Alekseyeva and A. P. Volkova *In its* Prob. of Space Biol., Nov. 1963 p 201–209 (See N64-11665 03-01) OTS: $7.00

Dogs exposed to spaceflight factors exhibit a wavelike fluctuation of the phagocytic index. The ingestive ability of neutrophils was most affected. The digestive ability of neutrophils

and the bactericidal function of plasma and skin were less affected. The appearance of Escherichia coli in the oral cavity in the immediate postflight period indicates a drop in the immunological activity. Similar changes in the immunological indices were obtained in ground tests after vibrations (70 cps, 0.4 mm amplitude) for 13 minutes and centrifuge accelerations (2, 6, 9, and 12 g) for one to two minutes. Dogs which have been exposed to spaceflight on previous occasions were less sensitive and showed less pronounced immunological changes, indicating an adaptation to the combined effects of spaceflight facors. Moderate immunological changes persisted in all dogs for months and sometimes years. Author

N64-11678* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF SPACE-FLIGHT CONDITIONS IN THE SATELLITE ON THE PRESERVATION OF THE VIABILITY OF CHLORELLA CULTURES

V. Ye. Semenenko and M. G. Vladimirova *In its* Prob. of Space Biol., Nov. 1963 p 211–226 refs (See N64-11665 03-01) OTS: $7.00

Cultures of Chlorella pyrenoidosa in sealed ampules in liquid nutrient media of varying densities and on agar slants were exposed to the effects of spaceflight for 24 hours on the second orbital spaceship. Periodic illumination was provided for photographic and television observations. Macroscopic observations of the cultures immediately upon return to earth did not reveal clotting, cottony deposits, or other pathogenic signs. Comparative studies of cell morphology, photosynthetic activity, mutations, and culture growth and development all indicated that the experimental cultures had good resistance to the effects of launching, spaceflight, and reentry. In general, viability was preserved and the principal physiological processes, i.e., photosynthesis, growth, development and reproduction, showed no irreversible changes. However, the cultures had varying amounts of damaged cells and, upon cultivation, showed decreased photosynthetic activity immediately after landing. After 6 days of active growth, the algae approached the normal condition of the control cultures. Author

N64-11679* National Aeronautics and Space Administration, Washington, D.C.

EFFECTS OF FLIGHT IN THE SECOND SOVIET SATELLITE ON THE HEMOPOIETIC ORGANS OF ANIMALS

M. A. Arsen'yeva, V. V. Antipov, V. G. Petrukhin, T. S. L'vova, N. N. Orlova, and S. S. Il'ina *In its* Prob. of Space Biol., Nov. 1963 p 227–241 refs (See N64-11665 03-01) OTS: $7.00

Laboratory mice were used in the second satellite flight. Cytological investigations of bone marrow cells in the tested animals showed a statistically significant increase of mitotic damage, compared with the control animals. Comparison of this data with that obtained after exposure of the bone marrow cells to radiation of 50 r indicates that the damage caused by exposure to spaceflight does not decrease until the 60th day after exposure. Furthermore, the chromosomal fragmentation so characteristic of radiation damage during chromosome exchanges was almost absent. The morphological picture of bone marrow up to the 30th day after flight revealed an increase of myelopoesis, accompanied by the appearance of young white blood cell forms and an inhibition of erythropoesis. The histological investigation of the spleen showed a depression of hemopoiesis during the first 10 days, but a return of hemopoietic function accompanied by the appearance of young blood cell forms occurs by the 30th day. Author

N64-11680* National Aeronautics and Space Administration, Washington, D.C.

EFFECTS OF COSMIC FLIGHT FACTORS ON THE INCIDENCE OF RECESSIVE LETHAL MUTATIONS IN THE X-CHROMOSOME OF DROSOPHILA MELANOGASTER

Ya. L. Glembotskiy, E. A. Abeleva, Yu. A. Lapkin, and G. P. Parfenov *In its* Prob. of Space Biol., Nov. 1963 p 243–254 refs (See N64-11665 03-01) OTS: $7.00

For two lines of Drosophila melanogaster, a statistically reliable increase of mutation frequencies was observed after spaceflights (0.56 ±0.07 percent and 0.96 ±0.16 percent); the strain D-18, which is characterized by greater spontaneous mutability, proved to be more sensitive to the mutagenic effect of the whole complex of spaceflight factors. Twenty of the lethal mutations were cytologically analyzed and were shown to be point mutations. The occurrence of point mutations and the increase in spermatid mutation rate, as compared with mature sperm, indicate the possibility of cosmic radiation being the responsible factor. But, until the mutagenic effect of such spaceflight factors as rocket vibration and acceleration has been elucidated by further experiments, the mutagenic effect of cosmic radiation alone cannot be accurately determined. Author

N64-11681* National Aeronautics and Space Administration, Washington, D.C.

INCIDENCE OF DOMINANT LETHAL MUTATIONS IN DROSOPHILA MELANOGASTER DURING A SATELLITE FLIGHT

G. P. Parfenov *In its* Prob. of Space Biol., Nov. 1963 p 255–258 refs (See N64-11665 03-01) OTS: $7.00

After flight in a space satellite, the frequency of dominant lethal mutations which occurred in spermatids of male Drosophila, strain D-32, was significantly increased. No increase in these mutations was observed in mature spermatozoa. However, the frequency of dominant lethal mutations was also increased in both spermatids and spermatozoa when male flies were subjected to vibrations of 70 c/s on earth. No firm conclusions can be drawn, at present, on the contribution of vibrational effects to the induction of mutations during spaceflight. Author

N64-11682* National Aeronautics and Space Administration, Washington, D.C.

INFLUENCE OF SPACE-FLIGHT FACTORS ON HEREDITY AND DEVELOPMENT IN ACTINOMYCETES AND HIGHER-ORDER PLANTS

Ya. I. Glembotskiy, A. A. Prokof'yeva-Belgovskaya, Z. B. Shamina, V. V. Khvostova, S. A. Valeva et al *In its* Prob. of Space Biol., Nov. 1963 p 259–271 refs (See N64-11665 03-01) OTS: $7.00

Actinomyces erythreus, strain 2577, had a sixfold increase in viability (measured by the number of spores which survived and colonies which developed) as compared with the controls. The viability of *Actinomyces erythreus* 8594, a radiosensitive strain, was reduced to one-twelfth, and that of *Actinomyces aureofaciens* LS-B-2201 to one quarter. *Actinomyces streptomycini* Kras. strain LS-3 formed spores, while its mycelium autolyzed. Air-dry seeds of two types each of corn and peas and one of winter wheat were exposed to spaceflight, following which chromosome damage in the root cells of the seedlings was investigated. Both types of peas and one of corn showed increases in the mitotic index. All of the seeds showed chromosome rearrangements. Winter wheat (hybrid 188) showed the greatest number, which was to be expected since this hybrid is sensitive to both γ-rays and fast neutrons. However, the "Spartanets" pea type, which is resistant to γ-rays, also showed a statistically significant number of chromosome rearrangements. Author

N64-11683* National Aeronautics and Space Administration, Washington, D.C.

INFLUENCE OF SPACE-FLIGHT CONDITIONS ON SEEDS OF ALLIUM FISTULOSUM (SPRING ONION) AND NIGELLA DAMASCENA (NUTMEG FLOWER)

V. N. Sidorov and N. N. Sokolov *In its* Prob. of Space Biol., Nov. 1963 p 273–276 (See N64-11665 03-01) OTS: $7.00

The effect of spaceflight on seeds of *Allium fistulosum* and *Nigella damascena* was studied. There was no influence on the frequency of chromosome rearrangements, but the rate of seed germination was markedly increased in *Nigella damascena* but not in *Allium fistulosum*. This latter effect does not appear to be due to exposure of the seeds to cosmic radiation, but may depend on other factors encountered in flight.

Author

N64-11684* National Aeronautics and Space Administration, Washington, D.C.

SPACE-FLIGHT FACTORS AND PRIMARY NONDISJUNCTION OF CHROMOSOMES

N. P. Dubinin and O. L. Kanavets *In its* Prob. of Space Biol., Nov. 1963 p 277–282 refs (See N64-11665 03-01) OTS: $7.00

In order to test the effects of spaceflight on the nondisjunction of chromosomes, homozygotic, white-eyed, unfertilized female *Drosophila* were used. Upon return, they were exposed to red-eyed males. The percentage of offspring affected by spaceflight factors was 0.19% ±0.021. When white-eyed control females were bred in a similar manner, the percentage of spores caused by nonseparation of the X-chromosome was only 0.048% ±0.017. The amount of radiation absorbed during the flight of Vostok I was too small to account for this change. In addition, laboratory experiments with X-rays have indicated that radiation effects are of short duration, lasting only 6 days. However, flies exposed to spaceflight factors produced an equally high percentage of mutants during the entire 18-day study, indicating an equally high number of chromosome separation failures. This indicates that spaceflight factors, unlike radiation, affect not only oocytes and maturing ova but also the oogonia. Therefore, it seems probable that the factors responsible for the disruption of chromosome separation are due to vibration, weightlessness, or combined factors. Author

N64-11685* National Aeronautics and Space Administration, Washington, D.C.

INFLUENCE OF SPACE-FLIGHT FACTORS ON THE LEVEL OF SEROTONIN IN THE BLOOD OF ANIMALS

V. S. Shashkov, V. V. Antipov, M. O. Raushenbakh, G. A. Chernov, and V. A. Maslennikova *In its* Prob. of Space Biol., Nov. 1963 p 283–290 refs (See N64-11665 03-01) OTS: $7.00

Changes in the serotonin (5-oxytriptamine) level in the blood of animals subjected to flight on orbital spaceships IV and V have been studied by Vane's method (ability of serotonin to cause contraction of smooth muscle fibers). Control animals kept at the home laboratory and those taken to the cosmodrome had identical (0.12 to 0.2 μg/ml) serotonin concentrations. Dogs flown in the spaceships showed an eight fold to tenfold drop in the serotonin level one to two days after flight. After two days this level returned to normal and remained normal up to 240 days. Similar reductions (by a factor of 4.3 to 10) in this level were obtained in mice and guinea pigs subjected to vibrations (35 and 70 cps, amplitude 0.4 mm) for 15 minutes, accompanied by acceleration overloads of 10 g. Restoration to normal levels of serotonin in the blood was noted after two days in the case of mice subjected to vibrations of 70 cps, and after one day in the case of those subjected to 35 cps. Author

N64-11686* National Aeronautics and Space Administration, Washington, D.C.

DETERMINATION OF THE INDUCED RADIOACTIVITY IN THE SECOND SOVIET ARTIFICIAL SATELLITE

V. V. Matveyev and A. D. Sokolov *In its* Prob. of Space Biol., Nov. 1963 p 291–293 refs (See N64-11665 03-01) OTS: $7.00

The possibility of the materials and instruments of a satellite becoming radioactive during flight in space cannot be ruled out. The residual γ-activity of bioelements AMN-1 (instruments specially developed for automatic recording of the biological activity of microorganisms under space conditions), used in the second Soviet satellite was determined. The measurements were made by means of a 4π-scintillation (absorption) counter 15 days after the return to earth of the capsule. At that time, the residual γ-activity, if present at all, did not exceed 10^{-10} radium gram equivalent. Author

N64-11687* National Aeronautics and Space Administration, Washington, D.C.

SOME RESULTS OF MEDICAL AND BIOLOGICAL INVESTIGATIONS IN THE SECOND AND THIRD SATELLITES

V. V. Antipov, R. M. Bayevskiy, O. G. Gazenko, A. M. Genin, A. A. Gyurdzhian et al *In its* Prob. of Space Biol., Nov. 1963 p 295–313 (See N64-11665 03-01) OTS: $7.00

Water and food were provided together in a mixture solidified with agar in order to facilitate automatic dispensing in conditions of weightlessness. This was carried out twice daily by command signals from the earth. Telemetric recording of the physiological parameters of the dogs Belka and Strelka during spaceflight showed the occurrence of tachycardia as a result of acceleration, noise, and vibration, and there was also a rise in the respiration rate; a return to normal preflight values occurred during the condition of weightlessness. Movements of the animals were observed by television cameras and by strain gage sensors mounted in the harness. No abnormalities were observed in the behavior of the animals after return to earth or during the following 3 months. It was concluded from the experiments carried out in the second satellite that dogs could readily be accustomed to spaceflight conditions. Genetic changes were noted in the progeny of actinomycetes, plant seeds, and fruit flies after return from spaceflight. Author

N64-11688* National Aeronautics and Space Administration, Washington, D.C.

MEDICAL AND BIOLOGICAL INVESTIGATIONS CARRIED OUT ON SOVIET ARTIFICIAL SATELLITES

O. G. Gazenko, V. I. Yazdovskiy and V. N. Chernigovskiy *In its* Prob. of Space Biol., Nov. 1963 p 315–318 (See N64-11665 03-01) OTS: $7.00

A general discussion of the problems connected with the choice of the experimental animal and the logistics for the biological experiments in the satellite is presented. The importance of careful design of the instrumentation and of the proper choice and thorough training of the experimental animals is emphasized. Author

N64-11689* National Aeronautics and Space Administration, Washington, D.C.

PRESSURIZED CAPSULE FOR AN ANIMAL

A. M. Bakhramov and V. I. Yazdovskiy *In its* Prob. of Space Bio., Nov. 1963 p 319–328 refs (See N64-11665 03-01) OTS: $7.00

A sealed cabin for housing animals during space flights is illustrated and described. It consists of a cylindrical capsule, 64 cm in diameter and 80 cm in length, made of 2-mm aluminum sheet, and provided with a detachable lid containing a

plastic inspection port 16 cm in diameter. The capsule resisted excess internal and external pressures up to 1.5 atm without structural damage or leaking, and temperatures ranging from −40° to 50° C. The capsule is equipped internally with air conditioners and regenerators, automatic feeding and other apparatus, supported upon a metal frame. It was possible to maintain animals, in a normal state of activity, in the capsule for 20 days. Author

N64-11690* National Aeronautics and Space Administration, Washington, D.C.

RESEARCH APPARATUS

B. G. Buylov and R. G. Gryuntal *In its* Prob. of Space Biol., Nov. 1963 p 329–338 refs (See N64-11665 03-01) OTS: $7.00

The methods used for recording physiological data in the dog, Layka, during the second spaceflight are described. The electrocardiogram was picked up by silver electrodes implanted in the chest wall and amplified 3000-fold before transmission. Respiratory movements were picked up by two strain gages surrounding the chest and connected in parallel. Arterial blood pressure was recorded by a piezoelectric element applied to the carotid artery; an occluding cuff was periodically inflated and deflated by a piston, the internal pressure being recorded potentiometrically through a second channel in order to determine the cutoff pressure by the usual sphygmomanometric procedure. Movements were recorded by means of a spring-loaded thread attached to the animal and running to a variable resistance. The temperature and pressure of the air in the cabin were also recorded. An amplifier pack was provided to handle the telemetered information and incoming command signals. The system gave satisfactory service during the flight of the dog, Layka, in the second earth satellite. Author

N64-11691* National Aeronautics and Space Administration, Washington, D.C.

AIR REGENERATING SYSTEM IN A PRESSURIZED CAPSULE

A. D. Seryapin *In its* Prob. of Space Biol., Nov. 1963 p 339–352 refs (See N64-11665 03-01) OTS: $7.00

A system has been developed for regenerating the air in sealed capsules occupied by animals during spaceflights. A chemical method was used, and the air was brought in contact with the regenerator by electric fans. The total weight of the installation was 1/8 of that of a conventional system using soda-lime, silica gel, and oxygen gas. The air in sealed containers occupied by dogs weighing 5 to 7 kg could be maintained in a satisfactory condition by means of the installation for periods as long as 30 days, and the system was subsequently used in the second spaceflight with the dog Layka. Author

N64-11692* National Aeronautics and Space Administration, Washington, D.C.

PREPARATION OF THE ANIMAL PRIOR TO THE EXPERIMENT

O. G. Gazenko and V. S. Georgiyevskiy *In its* Prob. of Space Biol., Nov. 1963 p 353–359 refs (See N64-11665 03-01) OTS: $7.00

Dogs are considered to be the most suitable animals for spaceflight experiments; they should be crossbred males, not more than 6 kg in weight and 1.5 to 6 years old. The animals are first trained to become accustomed to confinement for 20 days in cages of gradually decreasing size, the final one being 54 × 41 × 20 cm. They are then adapted to existence in a hermetically sealed container 64 cm in diameter and 80-cm long containing all the appropriate equipment which is required for the spaceflight. The described procedure was used in selecting the dog, Layka, for the successful spaceflight. Author

N64-11693* National Aeronautics and Space Administration, Washington, D.C.

SANITARY DEVICES IN PRESSURIZED CAPSULES

O. G. Gazenko, A. A. Gyurdzhian and G. A. Zakharyev *In its* Prob. of Space Biol., Nov. 1963 p 361–368 refs (See N64-11665 03-01) OTS: $7.00

A device to collect and remove the excreta of animals that remain in a sealed cabin for many days is described. The device is made of rubber-impregnated knitted fabric and worn by the animal. The excreta are collected in a special can. The device functions quite well, and gives the animal sufficient freedom of movement and does not annoy it during the 20-day experiment. The technique described was successfully used for Layka on the second earth satellite and on the subsequent satellite spaceships. Author

N64-11694* National Aeronautics and Space Administration, Washington, D.C.

FASTENING OF AN ANIMAL IN A PRESSURIZED CAPSULE, FABRIC APPAREL AND DISTRIBUTION OF SENSORS FOR THE REGISTRATION OF PHYSIOLOGICAL FUNCTIONS

O. G. Gazenko and A. A. Gyurdzhian *In its* Prob. of Space Biol., Nov. 1963 p 369–377 refs (See N64-11665 03-01) OTS: $7.00

A fabric harness has been developed for affixing sensors to the body of a dog during spaceflight. It consists of two pieces which fit over the head and forelimbs, and hindquarters, respectively, and which are joined together by straps. A pocket in the neckpiece accommodates the sensor for recording pulse rate and arterial pressure. The harness is fixed to the capsule wall by means of chains which permit free movement of the animal, and, at the same time, prevent traction on the sensor leads. The harness was tolerated by animals for periods of up to 20 days, and was used on the dog Layka during the second spaceflight. Author

N64-11695* National Aeronautics and Space Administration, Washington, D.C.

PROVIDING DOGS WITH FOOD AND WATER UNDER SPACE-FLIGHT CONDITIONS

I. S. Balakhovskiy, L. I. Karpova, and S. F. Simpura *In its* Prob. of Space Biol., Nov. 1963 p 379–392 refs (See N64-11665 03-01) OTS: $7.00

The amount of food and water required by dogs, weighing 5 to 8 kg, during spaceflight conditions has been determined. In a preliminary study of energy requirements, the oxygen consumption of 8 dogs ranged from 0.604 to 0.90[illegible] l/hr/kg, and the 24-hour energy expenditure from 66 to 107.[illegible] kg/body weight. These figures did not change essentially when the animals were confined in a simulated space cabin. Three dogs kept under similar conditions for 20 days remained well and lost no weight on a daily diet of 50 to 100 g of a jelly containing meat, sugar, and fat to a total calorific value of 500 kcal/100 g. The average daily intake of water was 120 ml, and the average rate of loss of water in the breath was 0.8 g/kg/hr. The construction of an automatic feeding apparatus is described, and also the regime used for feeding the dogs Layka, Belka, and Strelka during their spaceflights. Author

N64-11696* National Aeronautics and Space Administration, Washington, D.C.

RESULTS OF EXPERIMENTS CARRIED OUT IN SATELLITES

I. S. Balakhovskiy, O. G. Gazenko, A. A. Gyurdzhian, A. M. Genin, and A. R. Kotovskaya *In its* Prob. of Space Biol., Nov. 1963 p 393–404 refs (See N64-11665 03-01) OTS: $7.00

The main part of this work deals with the experiments carried out on dogs in pressurized capsules of the satellites. Electrocardiographic data, air pressure and air temperature data, respiration, carotid artery oscillations, arterial pressure data, and actogram data are discussed, and tracings of all the above variables shown against a time marker during the launching stage of a satellite. It is concluded that the launching period is satisfactorily endured by the animal, and the changes in the physiological function are well tolerated and are characteristic of the acceleration, noise, and vibrations. Full analogy between the respiratory and cardiac activities encountered during the propulsive stage of the flight and those in simulated laboratory tests was established. The animals endured equally well the transition from increased weight to the state of complete weightlessness. During the orbiting state, a considerable normalization of the cardiovascular and respiratory systems was observed. There was absence of any motor disturbance during that stage. Author

N64-11697* National Aeronautics and Space Administration, Washington, D.C.

THE AMINOACID COMPOSITION OF CHLORELLA-CHLORELLA PYRENOIDOSA

N. M. Sisakyan, E. N. Bezinger and M. G. Shaposhnikova *In its* Prob. of Space Biol., Nov. 1963 p 405–410 refs (See N64-11665 03-01) OTS: $7.00

The aminoacid composition of *Chlorella pyrenoidosa*, grown in an intensive culture, was investigated. Published information and the results of the experiments prove that this plant contains all the aminoacids required by man in quantities close to those of casein, a protein of high nutritive value. Author

N64-11698* National Aeronautics and Space Administration, Washington, D.C.

THE EFFECT OF GENERAL VIBRATION ON THE ANIMAL BODY

V. S. Georgiyevskiy and Ye. M. Yuganov *In its* Prob. of Space Biol., Nov. 1963 p 411–420 refs (See N64-11665 03-01) OTS: $7.00

Responses of some physiological functions to general vibrations have been investigated to elucidate the action of vibrations appearing at the active phase of a satellite flight upon the animal organism. Vibrations caused a considerable increase in the rate of heart muscle contractions and a moderate rise in arterial blood pressure. The changes in physiological functions observed can be of help in analyzing the effect of the flight on the animal onboard the satellite. Author

N64-11699* National Aeronautics and Space Administration, Washington, D.C.

THE EFFECT OF PROLONGED TRANSVERSE ACCELERATION ON ANIMALS

A. R. Kotovskaya and Ye. M. Yuganov *In its* Prob. of Space Biol., Nov. 1963 p 421–428 refs (See N64-11665 03-01) OTS: $7.00

The paper considers the effect upon animal organisms (dogs) of variable long-term accelerations acting transversely to the body axis. It has been found that the animals satisfactorily endured accelerations ranging from 2 to 10 g for 6 minutes, though the accelerations brought about essential changes in main indices of cardiovascular and respiratory systems. Their functions returned to normal 5 to 10 minutes after the action stopped. Author

N64-11700* National Aeronautics and Space Administration, Washington, D.C.

THE PROBLEM OF THE BIOLOGICAL ACTION OF COSMIC AND SOLAR RADIATIONS IN THE MOUNTAINS

V. I. Danileyko *In its* Prob. of Space Biol., Nov. 1963 p 429–437 refs (See N64-11665 03-01) OTS: $7.00

Hair depigmentation in people and animals, remaining for long periods at an altitude of 2200 to 3900 m above sea level, is evidently a result of the action of cosmic radiation particles on surface tissues of an organism. The high sensitivity to ionizing radiations of hair follicles of black mice makes it possible to employ the animals as biological indicators of cosmic radiation. In the case of the appearance of gray spots on the hairy coat of the animals the conclusion that heavy nuclei of cosmic radiation have struck the tissue can be drawn only if ionization traces are found there histologically. It was also found that mice staying in an open cage at the altitude of 2900 to 3900 m for 10 days showed a 13% increase in erithrocytes, as compared to the animals protected from solar radiation. This confirms the idea previously suggested by various authors, of the influence of solar radiation upon the hemopoietic function of bone marrow both in usual and mountain conditions. Author

N64-11701* National Aeronautics and Space Administration, Washington, D.C.

METHODS OF INVESTIGATING THE BLOOD CIRCULATION OF THE BRAIN UNDER CONDITIONS OF A MODIFIED GRAVITATIONAL FIELD

Yu. Ye. Moskalenko, R. M. Bayevskiy and O. G. Gazenko *In its* Prob. of Space Biol., Nov. 1963 p 439–443 refs (See N64-11665 03-01) OTS: $7.00

A description is given of a transistorized electroplethysmograph and its use for recording intracranial electroplethysmograms in dogs undergoing prolonged experiments and centrifuge runs. Information is given on applying the electroplethysmograph for investigating the degree of blood filling various parts of a man's body. Recommendations are made on using the described method during spaceflights. Author

N64-11702* National Aeronautics and Space Administration, Washington, D.C.

CONTAINERS FOR CERTAIN BIOLOGICAL MATERIALS USED IN EXPERIMENTS IN SPACESHIPS

I. V. Baranovskaya and A. A. Gyurdzhian *In its* Prob. of Space Biol., Nov. 1963 p 445–447 refs (See N64-11665 03-01) OTS: $7.00

Plexiglas containers used for carrying various biological material during the spaceship experiments, i.e., green plants, Drosophila, spiderwort, seeds and seedlings, Actinomycetes and Chlorella are briefly described. The containers met all the requirements of prolonged flight experiments. They allowed free access of light and air, and their transparency made it possible to observe the material by means of cine or television cameras. The biological material and containers suffered no damage and were used successfully in the second and subsequent Soviet satellites. Author

N64-11703* National Aeronautics and Space Administration, Washington, D.C.
ENSURING LIVING CONDITIONS FOR MICE DURING PROLONGED FLIGHT IN SPACESHIPS AND SATELLITES
I. V. Baranovskaya and A. A. Gyurdzhian *In its* Prob. of Space Biol., Nov. 1963 p 449–452 refs (See N64-11665 03-01) OTS: $7.00

A detailed description of containers for mice, used during satellite flights, is given. Also described is a feeding device for dispensing briquetted food. Water was supplied separately through a wick mechanism. A particular feature of the latter was that the rate of water supply was purely a function of the capillary effect and was independent of any such factors as accelerations, jerks, weightlessness, etc. The system proved successful in every respect, and was used during the 25-hour flight of the second satellite. Author

N64-11704* National Aeronautics and Space Administration, Washington, D.C.
METHOD OF "INTEGRATED" PHONOCARDIOGRAPHY
R. M. Bayevskiy *In its* Prob. of Space Biol., Nov. 1963 p 453–455 (See N64-11665 03-01) OTS: $7.00

The technique of "integrated" phonocardiography was developed for the purpose of lowering the capacity of the telemetry channel required for the transmission of phonocardiograms. It relies on separation of the low-frequency envelope of audiosignals by detection and integration of output signals of the phonocardiograph amplifier. As a result, the information relating to the frequency content is lost, but it is still possible to determine all the parameters related to the functioning of the heart muscle. Consequently, telemeter channels with a capacity considerably lower than that required for transmitting the usual types of phonocardiograms can be used. Author

N64-11705* National Aeronautics and Space Administration, Washington, D.C.
A TECHNIQUE FOR RECORDING SPHYGMOGRAMS OF DOGS
R. M. Bayevskiy and V. I. Polyakov *In its* Prob. of Space Biol., Nov. 1963 p 457–459 (See N64-11665 03-01) OTS: $7.00

A technique is described for measuring changes in the blood pressure of dogs during spaceflight. Measurement is made by means of rubber tubes or sleeves containing carbon which record changes in the movement of the walls of the carotid artery. The movement can be converted to an electrical signal which is amplified and traced. Blood-pressure changes in the caudal artery are measured by a similar device in the form of a ring. Author

N64-11706* National Aeronautics and Space Administration, Washington, D.C.
RECORDING OF SEISMOCARDIOGRAMS IN DOGS
R. M. Bayevskiy and L. A. Kazar'yan *In its* Prob. of Space Biol., Nov. 1963 p 461–464 refs (See N64-11665 03-01) OTS: $7.00

The fundamentals of seismocardiography are briefly discussed, and the constructional details of a sensor working on the principle of an electromagnetic-inertial transducer are given. The transducer was designed for a dog, and was built in a small (60- × 50- × 20-mm) metallic box containing a flat spring, carrying a seismic mass which served as the magnetic element of the transducing system. Two induction coils serve as the secondary elements of the system. The transducer was placed on the spine of the animal, and the working parameters were so chosen that the cardiac contractions could be recorded without any motor disturbances. Well-defined systolic and diastolic portions of the seismocardiogram are shown on the example of the dog Al'fa. The above tracing is compared with the ordinary ECG tracing. Author

N64-11707* National Aeronautics and Space Administration, Washington, D.C.
THE CHOICE OF LEADS AND THE ANALYSIS OF ELECTROCARDIOGRAMS IN DOGS
R. M. Bayevskiy and M. M. Osipova *In its* Prob. of Space Biol., Nov. 1963 p 465–469 refs (See N64-11665 03-01) OTS: $7.00

The standardization of electrocardiographic methods and their application to the study of dogs during spaceflights are discussed. The work is based on 500 ECG tracings obtained on 20 dogs. It is concluded that all the ECG wave patterns may be subdivided into five fundamental structural types. Furthermore, it is suggested that the following leads are most suitable for the above purpose: 2, 3, CR-1, CR-3, CL-1, CL-3, VF, and VL. The values of certain electrocardiographic parameters, including RR, ΔRP, PQ, QRS, and systolic index are given, showing the limits of normal variations. All the tracings were taken on a type 4 PFD-7 electrocardiograph. Author

N64-11708* National Aeronautics and Space Administration, Washington, D.C.
THE STUDY OF BIOLECTRIC POTENTIALS AND OXYGEN PRESSURE IN BRAIN TISSUES DURING HYPOXIA
Ye. A. Kovalenko and V. B. Malkin *In its* Prob. of Space Biol., Nov. 1963 p 471–482 refs (See N64-11665 03-01) OTS: $7.00

Under conditions of hypoxia, the animals tested revealed regular changes in their EEG which could be divided into two phases. The first phase was characterized by the appearance of high-voltage slow waves of gradually increasing amplitude, and the second phase was characterized by a depression of biocurrents, and a sharp diminishing of the amplitude and frequency of biopotentials. The results of the above experiments in various animals did not show a strict correlation between the changes in EEG and oxygen tension which occurred during and after the development of hypoxia. At the same time, relative changes in oxygen tension in the brain tissue of animals give grounds for believing that biopotential changes depend upon the oxygen tension in tissues. It should be noted that hypoxial changes in EEG depend not only upon a decrease in oxygen tension in a given part of the brain, but also upon the duration this decrease was being observed. Author

N64-11710* National Aeronautics and Space Administration, Washington, D.C.
A METHOD OF FASTENING ELECTRODES FOR REGISTERING AN ELECTROCARDIOGRAM DURING MANNED SPACE FLIGHTS
N. A. Agadzhanyan, I. T. Akulinichev, K. F. Zazykin and D. G. Maksimov *In its* Prob. of Space Biol., Nov. 1963 p 497–506 refs (See N64-11665 03-01) OTS: $7.00

Types of electrodes and methods of attaching them to the body were studied. Silver discs, 10 to 20 mm in diameter and 0.3 to 0.5 mm thick, gave good electrical contact with the least irritation to the skin. The edges were rounded and the undersurface was cupped in order to retain a layer of conducting paste. This consisted generally of sodium chloride, glycerol, lanoline, and antiseptics, and was best applied as a liquid layer to the skin, and as a semi-solid layer to the electrode. The electrodes were attached to the chest either by a covering of gauze

which was fixed in position with glue, or by means of an elastic harness. During the first few days after attachment, the interelectrode resistance ranged from 5000 to 40,000 ohms; after 10 to 14 days, the resistance had risen five to seven times. Both methods caused approximately 50-percent loss in the ECG signal after ten days, and provided satisfactory contact with the body for up to 13 days. The gauze method occasionally caused slight irritations which were absent in the case of the breast-strap method. Author

N64-11736 Argentina. Comision Nacional de Energia Atomica, Buenos Aires

A CHART FOR THE CALCULATION OF THE EXACT TOTAL DOSES FROM UNIFORMLY DISTRIBUTED SOURCES [DIAGRAMA PARA EL CALCULO DE DOSIS TOTALES DEBIDAS A FUENTES UNIFORMEMENTE DISTRIBUIDAS]

A. E. Placer, R. B. Bravo, H. A. Mugliaroli, and O. R. Moll 1963 8 p refs In SPANISH

(*Its* Informe No. 94)

A table is given from which can be obtained the total dose of radioactivity, in rads, to a tissue, organ, or to the whole body, under conditions in which the radioactivity is uniformly distributed. The radioactive dose is obtained from the effective half-life and the total energy of the radioisotope. R.T.K.

N64-11773 Minnesota U., Minneapolis

THORACIC CAGE IMPEDANCE MEASUREMENTS IMPEDANCE PRODUCT SYSTEM

Edwin Kinnen and William Kubicek Brooks AFB, Tex., School of Aerospace Medicine, Oct. 1963 14 p ref

(Contract AF 41(657)403)

(SAM-TDR-63-69; AD-423077)

The measurement of (1) peak-to-peak amplitude of a percent change of impedance measured across the thorax, (2) heart rate as a beat-to-beat dc voltage level, and (3) the product of these two variables is performed by an impedance product system. Results show that the peak amplitude can be measured by a charge storage and transfer system accurately to within 3%. The cardiac tachometer is linear within 2.5% in a range from 50 to 250 beats/min. Multiplication of the two variables is accomplished with Pace TR-10 analog computer components with an error of less than 1%. Overall accuracy of the system appears to be within 5%. Tests on several subjects illustrate the change in impedance product with time following the cessation of exercise. Author

N64-11781 Joint Publications Research Service, Washington, D.C.

THE ACTION MECHANISM OF MEDICINAL SUBSTANCES AS A BIOLOGICAL PROBLEM

S. V. Anichkov 16 Dec. 1963 9 p Transl. into ENGLISH of an article from Sov. Med. (Moscow), v. 27, no. 8, 1963 p 3-8

(JPRS-22292; OTS-64-21023) OTS: $0.50

The relationship between an understanding of the action mechanisms of certain chemicals on human cells and tissues and the treatment of ensuing illnesses is discussed. Clarification of the mechanism of the action of prussic acid on tissues made possible the substantiation of the therapeutic action of methemoglobin and methemoglobin formants in poisoning by cyanides. The discovery of the mechanism of the action of toxins which block the thiolic enzymes led to the creation of a powerful antitoxin for the treatment of poisoning by arsenic, mercury, and other heavy metals. The discovery of the anticholinesterase mechanism of action of physostigmine led to the creation of synthetic anticholinesterase. An understanding of the carbanhydrase mechanism has led to the development of diuretic remedies, the chief of which is Diacarb. Also, the use of antimetabolites in the treatment of malignant growths is discussed. I.v.L.

N64-11782 Joint Publications Research Service, Washington, D.C.

CYBERNETICS AND THE DEVELOPMENT OF CONTEMPORARY SCIENTIFIC KNOWLEDGE

I. B. Novik 16 Dec. 1963 16 p refs Transl. into ENGLISH of an article from Priorda (Moscow), no. 10, 1963 p 3-11

(JPRS-22296; OTS-64-21026) OTS: $0.50

In this review of cybernetics and the development of contemporary scientific knowledge, it is indicated that: (1) Cybernetics was the regular, natural result of the development of the scientific knowledge of the twentieth century, wherein the need for studying the information processes and the processes of control of complex dynamic systems appeared. (2) Cybernetics was not only the result of the progress of scientific knowledge, it intensified and accelerated the development of science. (3) The improvement of the functional-formalized approach made it possible to elaborate an extremely broad cybernetic method of analyzing qualitatively different phenomena. (4) The further development of dialectical-materialistic monism is a very important aspect in the elaboration of this fruitful scientific approach. I.v.L.

N64-11801* FMC Corp., Princeton, N.J. Chemical Research and Development Center

A STUDY OF THE FEASIBILITY OF THE REGENERATION OF CARBOHYDRATES IN A CLOSED CIRCUIT RESPIRATORY SYSTEM Final Report

G. C. Akerlof and P. W. D. Mitchell 1 Mar. 1963 197 p refs

(NASA Contract NASr-88)

(NASA CR-52972) OTS: $13.50 ph, $6.11 mf

A study has been made of the feasibility of producing formaldehyde from carbon dioxide. The process developed is carried out in two steps. In the first one, carbon dioxide is reduced with excess hydrogen in a glow discharge to the monoxide; in the second, the monoxide formed is reacted at ordinary temperatures with the remaining hydrogen in a silent discharge to give formaldehyde. A large laboratory unit has been built and tested for the continuous production of formaldehyde from carbon dioxide and hydrogen in a closed system at steady state. Two different types of silent discharge reactors were built for this pilot plant. Both were designed to come within a factor of two or three of the size required for a closed respiratory system with a crew of five. A mathematical analysis has been made of the design for a tapered, tubular, spinning, silent discharge reactor to operate at weightlessness with continuous feed of gas and liquid phase for absorption of formaldehyde generated. Sugars have been made by the condensation of aqueous formaldehyde using calcium hydroxide and solutions of lead oxide in sodium hydroxide as condensing agents. Author

N64-11821 North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.

HYPOTHERMIA AND ARTIFICIAL HIBERNATION FOR SPACE TRAVEL, A SURVEY

2 Mar. 1963 54 p 194 refs

(SID 63-354)

This is a survey of the research problem of sending a man on a long space voyage in a state of hypothermia or artificial hibernation. Bibliographic references include foreign language literature as well as English. Author

N64-11829 Joint Publications Research Service, Washington, D.C.
IMMUNOLOGY OF ACUTE RADIATION INJURY
R. V. Petrov 9 Apr. 1963 333 p refs Transl. into ENGLISH of a book "Immunologiya Ostrogo Luchevogo Porazheniya", Moscow, Gosatomizdat, 1962 p 1-267
(JPRS-18620; OTS-63-21545) OTS: $5.00

CONTENTS:
1. FIRST PART: THE EFFECT OF RADIATION ON ANTIMICROBIAL IMMUNITY R. V. Petrov p 3-87 refs (See N64-11830 03-16)
2. SECOND PART: INFECTIOUS PROCESSES IN THE IRRADIATED ORGANISM R. V. Petrov p 89-169 refs (See N64-11831 03-16)
3. THIRD PART: NONINFECTIOUS IMMUNOLOGY OF RADIATION SICKNESS R. V. Petrov p 170-328 refs (See N64-11832 03-16)

N64-11830 Joint Publications Research Service, Washington, D.C.
FIRST PART: THE EFFECT OF RADIATION ON ANTIMICROBIAL IMMUNITY
R. V. Petrov *In its* Immunol. of Acute Radiation Injury 9 Apr. 1963 p 3-88 refs (See N64-11829 03-16) OTS: $5.00

The antimicrobial immunity against infections in radiation sickness is so markedly impaired that susceptibility is increased not only to infection with pathogenic but also to conditionally pathogenic microorganisms. This increase in the sensitivity of irradiated animals occurs several days (on the average, three) after the effect of the ionizing radiation and lasts for 2 to 6 weeks or even longer, depending on the dose of radiation, species of animal, and the nature of the infectious process. If the infectious process is characterized by a progressive or prolonged course, the increased sensitivity of the organism to the pathogen of this infection is demonstrable when infection is carried out simultaneously with irradiation. Increased sensitivity observed from the infection of irradiated animals is an integral index of the injurious effect of radiation on immunity. Also, an analysis of the radiation on various immunity factors is presented. I.v.L.

N64-11831 Joint Publications Research Service, Washington, D.C.
SECOND PART: INFECTIOUS PROCESSES IN THE IRRADIATED ORGANISM
R. V. Petrov *In its* Immunol. of Acute Radiation Injury 9 Apr. 1963 p 89-169 refs (See N64-11829 03-16) OTS: $5.00

Endogenous and exogenous infections in the irradiated organism are reviewed. The section on endogenous infections covers: (1) sources of endogenous infections; (2) times of the occurrence of bacterial invasion; (3) the role of endogenous infection in the pathogenesis of radiation sickness; and (4) principles of antibiotic therapy in acute radiation sickness. The section on exogenous infections covers: (1) characteristics of the course of the infections; (2) the activating effect of irradiation on a latent infectious process; (3) the effectiveness of active and passive immunization; (4) the characteristics of infectious processes in leptospirosis, gas gangrene, and tetanus; and (5) the effectiveness of various types of therapy on gas gangrene and tetanus. I.v.L.

N64-11832 Joint Publications Research Service, Washington, D.C.
THIRD PART: NONINFECTIOUS IMMUNOLOGY OF RADIATION SICKNESS
R. V. Petrov *In its* Immunol. of Acute Radiation Injury 9 Apr. 1963 p 170-328 refs (See N64-11829 03-16) OTS: $5.00

This review covers discussions of the following: (1) the antigenic properties of the tissues of irradiated animals; (2) C-reactive protein and radiation sickness; (3) reactions of the irradiated organism to tissue antigens; and (4) the study of the effect of immunization sera on the tissues of irradiated animals. I.v.L.

N64-11853 Joint Publications Research Service, Washington, D.C.
REACTIONS OF THE CARDIOVASCULAR AND RESPIRATORY SYSTEMS OF ANIMALS DURING FLIGHTS IN HERMETIC CABINS OF ROCKETS UP TO AN ALTITUDE OF 212 KM
I. I. Kas'yan *In its* Sov. Rept. on Space Med. and Biol. 30 Apr. 1963 p 21-54 refs (See N64-11851 03-01) OTS: $2.25

Studies of the cardiovascular and respiratory systems of animals during flights in hermetic cabins of rockets up to an altitude of 212 km led to the following conclusions: (1) Flights of living organisms into cosmic space are possible and safe. (2) Physiological reactions of the cardiovascular and respiratory systems are most evident in the active propulsion of the rocket and during the period of reentry; during the weightlessness period, indices of basic physiological functions in dogs returned to initial values—in most cases after 5 to 6 minutes; in anesthetized animals the blood pressure, pulse, and respiratory rate during the period of weightlessness did not differ significantly from the initial values. (3) Test animals repeatedly exposed to rocket flights did not exhibit any pathological changes, with respect to the basic physiological systems of the organism, after 3.5 to 4 years. P.V.E.

N64-11858 Joint Publications Research Service, Washington, D.C.
HYGIENIC EVALUATION OF WORKING CONDITIONS IN WORK WITH HIGH-FREQUENCY CURRENTS
L. T. Frolova (Med. Inst. im. M.I. Kalinin, Omsk) *In its* Transl. on Hyg. and Safety 6 May 1963 p 6-9 refs (See N64-11856 03-01) OTS: $0.50

The scope of the investigation included work conditions and health status of persons dealing with ultrahigh frequency electric currents. As evidenced, the density of the wave flux intensity was in excess of the permissible levels. Changes in the health status of the operators could be observed, predominantly in the form of an asthenovegetative syndrome and cardiovascular disorders. All this is due to nonobservance of regulations for the location of operating units, and inadequate protective screening of generators. This is confirmed by the relationship between organic changes and service record. Author

N64-11859 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM VESTNIK AKADEMII NAUK SSSR, SERIYA BIOLOGICHESKAYA [MOSCOW], (HERALD OF THE ACADEMY OF SCIENCES USSR, BIOLOGY SERIES), NO. 2, 1963
L. A. Zilber et al 29 Oct. 1963 95 p refs Transl. into ENGLISH of 6 articles p 167-239
(JPRS-19571; OTS-63-21988) OTS: $2.25

CONTENTS:
1. ON THE ROLE OF VIRUSES IN THE ORIGIN OF CANCER L. A. Zilber p 1-16 refs
2. THE GENETICS OF TUMOR CELLS Yu. M. Olenov p 17-42 refs

3. SOME PHYSIOLOGICAL REACTIONS OF ANIMALS DURING FLIGHTS IN THE BIO-CABINS OF BALLISTIC ROCKETS UP TO HEIGHTS OF 450–473 km I. I. Kas'yan p 43–59 refs (See N64-11860 03-16)

4. THE REMOTE EFFECT OF COSMIC FLIGHT UPON THE VESTIBULAR-TONIC AND FLEXOR REFLEX IN THE GUINEA PIG Z. I. Apanasenko and M. A. Kuznetsova p 60–69 refs (See N64-11861 03-16)

5. MORPHOLOGICAL AND HISTOCHEMICAL INVESTIGATIONS OF THE LABYRINTH OF ANIMALS IN THE CONDITIONS OF A CHANGING GRAVITATIONAL FIELD Ya. A. Vinnikov, O. G. Gasenko, L. K. Titova, and A. A. Bronshteyn p 70–81 refs (See N64-11862 03-16)

6. MICRONECROTIC FOCI IN THE SPLEENS OF IRRADIATED ANIMALS V. A. Sondak, M. N. Meysel', and V. M. Manteyfel' p 82-92 refs

N64-11860 Joint Publications Research Service, Washington, D.C.

SOME PHYSIOLOGICAL REACTIONS OF ANIMALS DURING FLIGHTS IN THE BIO-CABINS OF BALLISTIC ROCKETS UP TO HEIGHTS OF 450-473 km

I. I. Kas'yan *In its* Transl. from Vestn. Akad. Nauk SSSR, Ser. Biol. [Moscow], no. 2, 1963 29 Oct. 1963 p 43–59 refs (See N64-11859 03-16) OTS: $2.25

The effect of overload and weightlessness on the main physiological functions of dogs when sent aloft in ballistic rockets to an altitude of 450 to 473 km was investigated. The effect of considerable overloads on the animals, as a rule, gave rise to marked changes in respiration and blood circulation. The pulse rate and the blood pressure increased, and the respiration rate for most of the animals rose. The EKG's of the dogs showed that no pathological changes arose during the flight. However, during various periods of the flight, changes in the duration of individual intervals and in spike configuration of the EKG were noted. Under weightlessness, in most cases, a tendency towards restoration of the recorded indices of cardiovascular and respiratory activity to the original level was noted. An examination of the dogs made 4 years after the flight revealed that the flight did not cause any unfavorable aftereffects in the general condition and behavior of the dogs. R.T.K.

N64-11861 Joint Publications Research Service, Washington, D.C.

THE REMOTE EFFECT OF COSMIC FLIGHT UPON THE VESTIBULAR-TONIC AND FLEXOR REFLEX IN THE GUINEA PIG

Z. I. Apanasenko and M. A. Kuznetsova *In its* Transl. from Vestn. Akad. Nauk SSSR, Ser. Biol. [Moscow], no 2, 1963 29 Oct. 1963 p 60–69 refs (See N64-11859 03-16) OTS: $2.25

The effect of spaceflight conditions on the functional state of the vestibular tonic and flexor reflexes in guinea pigs was investigated. Following the spaceship flight, the amplitude of the bioelectrical activity of the rear-extremity muscles (as recorded on an electromyogram during rest) was found to have increased significantly. In addition, there was a decrease in the latent period of the nonconditioned vestibular flexor reflexes. No reliable changes in the tonic reflexes were noted after 2 days following the spaceflight, whereas the latent period for the flexor reflexes decreased over a longer period of time. R.T.K.

N64-11862 Joint Publications Research Service, Washington, D.C.

MORPHOLOGICAL AND HISTOCHEMICAL INVESTIGATIONS OF THE LABYRINTH OF ANIMALS IN THE CONDITIONS OF A CHANGING GRAVITATIONAL FIELD

Ya. A. Vinnikov, O. G. Gasenko, L. K. Titova, and A. A. Bronshteyn *In its* Transl. from Vestn. Akad. Nauk SSSR, Ser. Biol. [Moscow], no. 2, 1963 29 Oct. 1963 p 70–81 refs (See N64-11859 03-16) OTS: $2.25

Data were obtained through the use of morphological and histochemical methods during investigation of the utricles of animals, both under conditions of relative repose and under conditions of radial acceleration. The action of 10 g for 3 minutes, in the direction "back-chest", induced in guinea pigs the phenomenon of expulsion of RNA-containing nucleolus from the nuclei to the basal region of the utricle hair cells, in the direction of the gravitational field vector. In the utricle receptor cells, a drop in content of cytoplasmatic RNA, total protein protein thiol, and carboxylic protein groups was observed. There was, as well, a drop in the activity of the oxidative enzymes of the mitochondria and of acetylcholinesterase in the region of the synapses. At accelerations of 10 g, the acetylcholinesterase activity in the region of the utricle synapse also decreases. R.T.K.

N64-11863 Wissenschaftliche Gesellschaft für Luft- und Raumfahrt, Cologne (W. Germany)

OPERATIONS RESEARCH IN AIR- AND SPACE-TRAVEL [UNTERNEHMENS-FORSCHUNG IN DER LUFT- UND RAUMFAHRT]

[1963] 95 p refs Report on the 3d Meeting of the Advisory Comm. Ottobrunn, 5 Feb. 1963 Chiefly in GERMAN; some ENGLISH

CONTENTS:

1. GENERAL INTRODUCTION TO MONTE CARLO METHODS F. Hammelrath (DFL, Brunswick) p 5–15 refs (See N64-11864 03-20)

2. ON THE FUNDAMENTALS OF MONTE CARLO METHODS G. Itzelsberger (Bolkow-Entwicklungen) p 14–26 (See N64-11865 03-20)

3. EXAMINATION OF SHORT RANDOM NUMBER SERIES WITH SO-CALLED ZONE TESTS E. Rusch (Siemens and Halske, Munich) p 27–64 refs (See N64-11866 03-20)

4. MONTE CARLO TECHNIQUES IN THE ANALYSIS OF AN AIRCRAFT MAINTENANCE ORGANIZATION J. R. Watson (Entwicklungsring Sud, Munich) p 65–73 (See N64-11867 03-20)

N64-11869 Joint Publications Research Service, Washington, D.C.

PROBLEMS OF SYSTEM ORGANIZATION IN THEORETICAL BIOLOGY

K. M. Khaylov 11 Dec. 1963 13 p refs Transl. into ENGLISH of an article from Zh. Obshch. biol. (Moscow), no. 5, 1963 p 324–333

(JPRS-22228; OTS-63-41339) OTS: $0.50

The logical basis of the idea of systemic organization was formed as a inter-discipline "general theory of systems." The biological part of this theory has been insufficiently developed, but it does include within itself three already formulated problems (the definition of the concept "living system," the enumeration of "objects" which can be examined in a systemic aspect, and the cosubordination of living systems within organic nature), which will lead in the future to the formation of a theory of systemic organization of living nature. The concept of systemic organization enters into theoretical biology as the evolutionary-phyletic concept. It is assumed that a single synthetic picture of life should capture both its aspects, evolutionary and organizational. The new structure of "synthetic" thought in biology, introducing the concept of the organizational discussion of the organic world, signifies rejection of a

view of living nature as a monolith consisting of organisms having a single environment, one or two "leading" factors, and one decisive unity (with conditions of life). At the same time, a return to the evolutionary theory is made by a renovated and differentiated concept of the basic material factors of evolution. I.v.L.

N64-11871 Joint Publications Research Service, Washington, D.C.

NEW APPARATUS FOR PHYSIOTHERAPY

K. D. Gruzdev et al 13 Dec. 1963 13 p Transl. into ENGLISH of 2 articles from Vopr. Kurortol., Fizioterapii i Lecheb. Fiz. Kul't. (Moscow), v. 28, no. 5, Sep.-Oct. 1963 398-402 and 465-466

(JPRS-22280; OTS-64-21016) OTS: $0.50

CONTENTS:

1. PHYSIOLOGICALLY OPTIMAL FORMS OF ELECTRICAL STIMULATION AND PROSPECTS OF THERAPEUTIC UTILIZATION OF THEM IN CONNECTION WITH THE DEVELOPMENT OF RADIO ELECTRONICS K. D. Gruzdev p 1-6

2. APPARATUS FOR ULTRASONIC THERAPY V. G. Yasnogorskiy p 7-10

N64-11874 Joint Publications Research Service, Washington, D.C.

EXPERIMENTAL TOXICOLOGY OF ORGANIC PHOSPHORUS INSECTICIDES

L. I. Medvyed, ed. 24 Dec. 1963 62 p Transl. into ENGLISH of Chapt. 5 from the book "Gigeniya i toksikologiya novykh pestitsidov i klinika otravleniy" Moscow, 1962 p 188-256

(JPRS-22450; OTS-64-21118) OTS: $1.50

The following articles are presented dealing with experimental toxicology of organic phosphorus insecticides: (1) Some Approaches to the Search for Selective Organic Phosphorus Insecticides of Low Toxicity for Man; (2) Relationship Between the Distribution of Organic Phosphorus Compounds in the Organism and Their Chemical Structure; (3) Anticholinesterase Activity of the Oxidation Products of Dethiophosphoric Acid Esters; (4) Some Methods of Studying Skin Penetrability of Organic Phosphorus Insecticides; (5) Comparative Toxicity of Phosphamide and Several Compounds with Related Chemical Structure; (6) The Toxicology of Mercaptophos; (7) Certain Data on the Toxology of "Dithiophos" and "Pyrophos"; and (8) Changes in Certain Blood Indices in the Conditioned-Reflex Activity of Animals Under "Methylmercaptophos". P.V.E.

N64-11882 Royal Air Force, Farnborough (Gt. Brit.) Inst. of Aviation Medicine

AERO-MEDICAL ASPECTS

W. K. Stewart *In* Advisory Group for Aeron. Res. and Develop. Proc. of the 12th AGARD Gen. Assembly Sep. 1962 p 93-109 refs (See N64-11877 03-01)

The accomplishments of the AGARD Aerospace Medicine Panel (and of its predecessor, the Aviation Medicine Panel) are reviewed in the context of topics discussed at symposia and meetings held during the past ten years and of the publications sponsored by the Panel. The research reported includes: methods and criteria for the psychological and medical selection of flying personnel; cockpit design and anthropometry; prevention of pilot error and pilot injuries; and vision in empty space and at low altitudes. Planned studies reflect the increased emphasis on space environmental factors; these will include cardiovascular assessment of pressure suits, gas mixtures in relation to cabin pressures, and biotelemetry-device development. Human problems associated with VTOL, low-level strike and reconnaissance, and supersonic transport aircraft operations will be investigated, and clinical, specialty, accident survey, and pathological studies will continue. M.P.G.

N64-11917 Joint Publications Research Service, Washington, D.C.

DEVELOPMENTS IN POPULAR CYBERNETICS

A. Khidekali 18 Dec. 1963 17 p Transl. into ENGLISH of an article from Nauka i Zhyttya (Kiev), no. 9, 1963 p 36-38

(JPRS-22345; OTS-64-21055) OTS: $0.50

Two articles are presented on the development and uses of cybernetics in the Ukraine. The first article deals with the importance of automation in industry, and the second describes a cybernetic instrument used for navigation of a ship by remote control. R.T.K.

N64-11918 Joint Publications Research Service, Washington, D.C.

CYBERNETICS IN MEDICINE AND PHYSIOLOGY

V. V. Parin and R. M. Bayevskiy 19 Dec. 1963 17 p refs Transl. into ENGLISH of the book "Kibernetika v meditsine i fiziologii" Moscow, State Publ. House of Med. Lit. 1963 p 1-119

(JPRS-22377; OTS-64-21071) OTS: $2.50

The following appear to be the main tasks of cybernetics in medicine and physiology: (1) the study of the brain and nervous system activities; (2) the investigation of automatic control systems in living beings; (3) the study of the interaction of cybernetic systems; (4) the study of problems relating to the use of mathematical methods to describe biological processes and analyze medical information; (5) the creation of new devices to collect and automatically process medical information (indicators of dangerous conditions, analyzers of biocurrents, single-channel recording systems, etc.); (6) the development of automatic diagnostic systems; (7) the development of biological control and stimulation systems for medical control and therapy; (8) the development of automatic recognition systems; (9) the development of models for research and teaching purposes; (10) the development of special instruments and devices to permit the use of existing electronic digital computers, analog computers, and memory devices for medical purposes; and (11) the provision of medical statistics, planning programs, and centralized administration for public health services. I.v.L.

N64-11946 Israel Program for Scientific Translations Ltd., Jerusalem

WORKS OF THE INSTITUTE OF HIGHER NERVOUS ACTIVITY. PHYSIOLOGICAL SERIES, VOLUME 6: EXPERIMENTAL STUDIES OF HIGHER NERVOUS ACTIVITY

V. S. Rustinov (Acad. Sci. USSR) ed. 1963 320 p refs Transl. of a book "Trudy instituta vysshei nervnoi deyatel'nosti seriya fiziologicheskaya" Moscow, Izdatel'stvo Akad. Nauk SSSR, 1961 (Publ. for HEW and NSF)

(IPST Cat. no. 985; OTS-63-11167) OTS: $3.25

CONTENTS:

1. EFFECT OF PHYSICAL INTENSITY OF A VISUAL STIMULUS ON THE PARAMETERS OF THE CONDITIONED MOTOR RESPONSES IN MAN I. A. Shevelev p 1-8 refs

2. EFFECT OF PHYSICAL INTENSITY AND SIGNAL MEANING OF A CONDITIONED VISUAL STIMULUS ON MEASUREMENTS OF MOTOR RESPONSES IN MAN I. A. Shevelev p 9-19 refs

3. PHYSIOLOGICAL CHARACTERIZATION OF CONDITIONED REACTIONS ELABORATED WITH VERBAL REINFORCEMENT N. Yu. Alekseenko p 20–24 refs

4. INTERACTION OF SIMULTANEOUS CONDITIONED REACTIONS ELABORATED WITH DIFFERENT REINFORCEMENTS IN HEALTHY PERSONS AND IN SCHIZOPHRENIC PATIENTS M. M. Trunova p 25–32 refs

5. EFFECT OF INTENSITY OF CONDITIONED AND UNCONDITIONED STIMULI ON THE MAGNITUDE OF A CONDITIONED–CONDITIONED DEFENSE REFLEX I. B. Kozlovskaya p 33–44 refs

6. THE FORMATION OF SPECIALIZED MOTOR REFLEXES TO DISTANT STIMULI E. I. Popva, M. E. Ioffe, O. N. Vasil'eva p 45–51 refs

7. EFFECT OF EXTIRPATION OF THE CORTICAL PART OF THE MOTOR ANALYSOR ON CONDITIONED MOTOR DEFENSE REFLEXES M. I. Samoilov p 52–61 refs

8. STUDY OF DEGREE OF CONCENTRATION OF THE EXCITATORY PROCESS IN THE ARC OF A STABLE CONDITIONED MOTOR DEFENSE REFLEX IN DOGS R. L. Vinnik p 62–71 refs

9. TONIC CONDITIONED ALIMENTARY MOTOR REFLEXES IN DOGS AFTER UNILATERAL EXTIRPATION OF THE MOTOR ANALYSOR CENTER M. E. Ioffe p 72–80 refs

10. CONTRIBUTION TO THE ANALYSIS OF DURATION OF A MOTOR DEFENSE REFLEX N. G. Ivanova p 81–87 refs

11. DISTINCTIVE FUNCTIONAL TRAITS OF SO-CALLED VOLUNTARY MOVEMENTS OF DOGS E. I. Popova p 88–95 refs

12. EFFECT OF THE CHANGE OF AMOUNT OF ALIMENTARY REINFORCEMENT ON THE MAGNITUDE OF A CONDITIONED SECRETORY-MOTOR REFLEX I. F. Aslanova p 96–104 refs

13. CHANGES IN THE MOTOR AND SECRETORY COMPONENTS OF A CONDITIONED ALIMENTARY MOTOR REFLEX DURING DIFFERENTIATION AND EXTINCTION O. N. Vasil'eva p 105–114 refs

14. SOME CORTICAL INTERACTION MECHANISMS OF DIFFERENT TYPES OF CONDITIONED REFLEXES IN DOGS U. G. Gasanov p 115–121 refs

15. INTERACTION OF CONDITIONED ALIMENTARY AND DEFENSE REFLEXES. REPORT 3 L. A. Preobrazhenskaya p 122–128

16. INTERACTION OF TWO EXCITATION CENTERS T. N. Ryantseva p 129–140 refs

17. INTERACTION OF EXTINCTION AND DIFFERENTIATION INHIBITION AT SUDDEN INTENSITY CHANGES OF THE INHIBITORY STIMULUS R. A. Cherkashina p 141–149 refs

18. A CONTRIBUTION TO THE PROBLEM OF THE INTERACTION OF EXCITATION AND INHIBITION. REPORT 2 I. M. Volkova p 150–161 refs

19. FORMATION OF A CONDITIONED POSTURAL REFLEX IN DOGS DURING ELABORATION OF A FOOD-OBTAINING REFLEX TO A MOVING STIMULUS I. M. Sheiman p 162–168 refs

20. CHAIN MULTIEFFECTOR ALIMENTARY REFLEXES OF MONKEYS TO A COMPLEX STIMULUS G. I. Shirkova, G. L. Verevkina p 169–175 refs

21. COMPARATIVE PHYSIOLOGICAL DATA ON DIFFERENTIATION BETWEEN TWO POSITIVE STIMULI Yu. A. Kholodov, N. L. Krushinskaya, Zh. P. Shuranova, and Z. D. Shcherbina p 176–182 refs

22. EFFECT OF ELECTRIC STIMULATION OF THE RETICULAR FORMATION ON CONDITIONED REFLEX ACTIVITY L. G. Voronin, K. G. Gusel'nikova, K. A. Lordanis, T. G. Beteleva, N. V. Linkova, and V. B. Polyanskii p 183–190 refs

23. INFLUENCE OF THE HIPPOCAMPUS ON CONDITIONED REFLEXES IN RABBITS N. A. Tushmalova p 191–199 refs

24. IMPORTANCE OF VARIOUS LAYERS OF THE CEREBRAL CORTEX IN THE PRODUCTION OF A DOMINANT CENTER BY APPLICATIONS OF A DIRECT CURRENT M. A. Ryabinina p 200–209 refs

25. CONDITIONED REFLEX RECONSTRUCTION OF THE HUMAN EEG RHYTHM DURING COMBINATIONS OF SOUND WITH A RHYTHMIC LIGHT p 210–218 refs

26. EXCITABILITY AND REACTIVITY OF THE RABBIT CEREBRAL CORTEX DURING ELABORATION OF A CONDITIONED DEFENSE REFLEX L. V. Tishaninova p 219–229 refs

27. LOCAL BIOELECTRIC PHENOMENA IN THE CEREBRAL CORTEX DURING CONDITIONED REFLEX ACTIVITY G. I. Shul'gina p 230–249 refs

28. SPATIAL CHANGES OF BIOELECTRIC CORTICAL AND SUBCORTICAL ACTIVITY IN RABBITS. REPORT 1 I. N. Knipst p 250–259 refs

29. "TRANSFERS", A PARTICULAR FORM OF SPATIAL DISTRIBUTION OF CORTICAL BIOELECTRIC ACTIVITY K. K. Monakhov p 260–270 refs

30. THE ADRENALIN TEST IN ELECTROENCEPHALOGRAPHIC STUDIES IN RABBITS A. M. Ivanitskii p 271–277 refs

31. EFFECT OF MERATRAN ON HIGHER NERVOUS ACTIVITY IN DOGS. REPORT I A. Ya. Mekhedova p 278–285 refs

32. EFFECT OF VARIOUS PHENAMINE DOSES ON HIGHER NERVOUS ACTIVITY IN ANIMALS, AND DETERMINATION OF OPTIMAL DOSES IN VARIOUS TYPES OF NERVOUS SYSTEMS A. M. Nuzhina p 286–293

33. EFFECT OF OPTIMAL DOSES OF PHENAMINE ON EXTINCTION INHIBITION A. M. Nuzhina p 294–299 refs

34. SOME INDIVIDUAL TRAITS OF LOCAL UNCONDITIONED DEFENSE REFLEX ACTION IN WHITE RATS L. V. Komarov p 300–306 refs

35. CONDITIONED REFLEX ACTIVITY OF WISTAR-STRAIN RATS V. E. Miklashevskii p 307–314 refs

N64-11949 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.

NYSTAGMUS RESPONSES OF THE CAT TO ROTATION AND TO DIRECTIONALLY EQUIVALENT AND NON-EQUIVALENT STIMULI AFTER UNILATERAL CALORIC HABITUATION

William E. Collins Aug. 1963 13 p refs
(CARI-63-14)

Six cats were exposed to mild angular accelerations before and after an intervening series of 15 caloric irrigations. All trails were in total darkness. Slow-phase displacement of the eyes, beat-frequency, and duration of nystagmus were scored. All 3 measures reflected a decline in both the primary and the secondary caloric measures. Responses to rotation following the caloric habituation showed almost no change, i.e., there was no apparent stimulus generalization. Differences in: (1) the patterns of nervous excitation elicited by unilateral and bilateral stimulation; and (2) intensity, were hypothesized as possible causes for the failure to obtain transfer. Additional unilateral caloric trials confirmed reports that the reduction of nystagmus is specific to the direction elicited during habituation trials. Author

N64-11959 Joint Publications Research Service, Washington, D.C.

BLOOD SUBSTITUTES AND TRANSFUSION

V. A. Ivanov et al 20 Dec. 1963 7 p Transl. into ENGLISH of a portion of a book "Khirurgiya", Moscow 1963 p 131–134 (JPRS-22401; OTS-64-21088) OTS: $0.50

The topics discussed are: (1) blood preparations—plasma, serum, erythrocyte mass, leukocyte mass, and thrombocyte mass; (2) blood substitutes—salt solutions, and solutions with human blood constituents; (3) donors, and the obtaining and preserving of blood. R.T.K.

N64-11987 California U., Berkeley Lawrence Radiation Lab.

SULFATE REDUCTION BY BACTERIA

Mark Leban and Charles R. Wilke 28 Aug. 1963 93 p refs (Contract W-7405-eng-48) (UCRL-10966) OTS: $2.00

Desulfovibrio aestaurii, a species of sulfate-reducing bacteria, was isolated from a mud sample obtained from a saltern. Isolation was complicated by an unknown straight rod bacteria, but was eventually achieved through the dilution method and through the "diffusion method." The isolated bacteria were grown in batch experiments to measure bacterial counts and sulfide concentrations. From the experimental data, the sulfate reduction rates in complex and simple lactate media were calculated. Correlations were set up expressing reduction rate in terms of growth rate and bacterial density. Reduction rates in a continuous cultivator were estimated. With another set of experiments, the effects of initial sulfate content on the sulfate reduction rate, and on percent conversion were studied. Also investigated was the effect of sodium chloride concentration on the reduction rate. Author

N64-11995 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.

HUMAN SURVIVABILITY OF EXTREME IMPACTS IN FREE-FALL

Richard G. Snyder Aug. 1963 31 p refs (CARI-63-15)

Fall distances ranged up to 275ft, and calculated velocities up to 116fps (79 mph). Physical and biological data are presented on both sexes with an age range of 1 1/2 to 91 years, and with impacts occurring in all body axis orientations. A detailed analysis of factors found to affect survivability in free-fall impacts is made. These cases, out of some 12,000 free-falls collected in the past two years, demonstrate that humans have survived impact forces considerably greater than those previously believed tolerable. Author

N64-12001* Maryland U., College Park

THE CAPACITY FOR ORGANIC SYNTHESIS IN CELLS OF SUCCESSIVE DEVELOPMENTAL STAGES

Constantine Sorokin Repr. from Arch. Mikrobiol. (Berlin), v. 46, 1963 p 29–43 refs (NASA Grant NsG-70-60)

Synthesis of organic matter was studied on synchronized suspensions of the green high-temperature alga, *Chlorella* 7-11-05, in regard to the composition of the suspending fluid, and the developmental status of cells. Rates of synthetic activity were determined as changes in optical density of algal populations. The validity of this technique was substantiated by special parallel measurements of changes in optical density, dry weight, and chlorophyll content of algal suspensions. It was found that cells of earlier developmental stages generally possess a higher capacity for organic synthesis than cells approaching the end of the life cycle. Vacillation of metabolic activity throughout the life cycle and in the course of measurements during one experiment was discussed, and a higher reliability of the time-course curves as compared with a set of data obtained for short-time intervals was ascertained. The regular sequence of changes in synthetic activity in the course of cell development was ascribed to the regularity of changes in the rates of the anabolic and catabolic moieties of the metabolic turnover. Author

N64-12009 Joint Publications Research Service, Washington, D.C.

EXPERIMENT IN THE PSYCHOLOGICAL CHARACTERISTICS OF TEMPERAMENT

N. S. Leytes 20 Dec. 1963 59 p refs Transl. into ENGLISH of a chapter of a book "Tipologicheskiye Osobennosti Vysshey Nervnoy Deyatel'nosti Cheloveka", Moscow, 1956 p 267–303 (JPRS-22405; OTS-64-21091) OTS: $1.50

An experiment into the characterization of the vital manifestations of nervous-activity types (temperament), on the basis of long-term personal observations of high-school students is described. This paper is divided into three divisions. The first two divisions present detailed psychological descriptions of three school graduates; the third division contains an analysis of the material presented. The object of the paper is to shed light on the problem of the vital manifestations of the basic properties of higher nervous activity, and to attempt to detect the vital indices by which it is possible to judge temperament and its individual features. P.V.E.

N64-12067 Joint Publications Research Service, Washington, D.C.

DETERMINATION OF THE DEGREE OF SPIRALIZATION OF TRANSPORT RNA BY THE FLUORESCENT PROPERTIES OF THEIR COMPLEXES WITH ACRIDINE DYES

O. F. Borisova et al 31 Dec. 1963 9 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSSR (Moscow), v. 152, no. 4, 1963 p1001–1004 (JPRS-22521; OTS-64-21166) OTS: $0.50

The degree of spiralization of transport ribonucleic acid (T-RNA) was investigated by a new method based on the differences in the duration of fluorescence of the dye, acridine orange, bound to spiral and despiralized sections of nucleic acids. T-RNA from yeast was isolated, and an aqueous solution of acridine orange was added to solutions of T-RNA of different concentrations (in a citrate buffer of 0.005 M + 0.05 mole of sodium chloride solution), in a quantity such that the final concentration of acridine orange in all cases was equal to 0.5×10^{-5} M. For these solutions, the absorption and fluorescence spectra were recorded, and the values of τ_z^T, where τ is the duration of fluorescence, (through a SZS-9+ZhS-18 filter) and τ_k^T (through a KS-10 filter) were measured. Results indicate that: (1) The degree of spiralization was 77.5%. However, the possibility is not ruled out that a future value for this degree may be changed somewhat in one direction or another. (2) The fluorescent characteristics of the acridine orange-T-RNA complex were practically identical to those which have been observed in the acridine orange-deoxyribonucleic acid complex. I.v.L.

N64-12068 Joint Publications Research Service, Washington, D.C.

THE EFFECT OF SUPRARENAL HORMONES ON THE RADIATION SENSITIVITY OF THE CHROMOSOMAL APPARATUS OF EPITHELIAL CELLS OF THE MOUSE CORNEA

Yu. Ya. Kerkis and V. V. Logvinova 31 Dec. 1963 7 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSR, (Moscow), v. 152 no. 4, 1963 p 992–994 (JPRS-22522; OTS-64-21167) OTS: $0.50

The effect of adrenalectomy before and after irradiation on the radiosensitivity of the chromosomes in the epithelial cells

of the mouse cornea was investigated. Results include the following: (1) The frequency of chromosome-rearrangement was practically the same for intact mice and for mice adrenalectomized after irradiation; therefore, adrenalectomy in itself did not increase the frequency of chromosome-rearrangement. (2) A dose of 25 r in animals adrenalectomized 3 hours before irradiation, as well as 24 hours before irradiation, caused more than a twofold increase in the percentage of rearrangements over those in intact mice irradiated with the same dose. From these results it can be concluded that: (1) the mechanism of protection does not amount to a prevention of the primary radiation injury but to the creation of more favorable conditions for recovery from the injuries which occurred initially under the beam; (2) the absence of any metabolites of suprarenal cortical metabolism in the body increased the injurious effect of irradiation on the chromosome-structure by approximately two times. I.v. L.

N64-12111 California U., Davis School of Veterinary Medicine

THE EFFECTS OF X-RADIATION ON WORK CAPACITY AND LONGEVITY OF THE DOG: LONG TERM EFFECTS OF X-RADIATION ON THE BEAGLE 12th Annual Progress Report

A. C. Anderson Jun. 1963 290 p refs
(Contract AT(04-3)-472)
(UCD-107) OTS: $3.50

CONTENTS:

1. EXPERIMENTAL BEAGLES LISTED BY SUBGROUP p 1–6

2. KENNEL MANAGEMENT AND CLINICAL OBSERVATIONS R. M. Johnson p 7–12 refs

3. ANNUAL EXAMINATION OF CONTROL AND X-IRRADIATED BEAGLES R. M. Johnson p 13–29 refs

4. DETECTABLE MAMMARY TUMORS IN AGEING X-IRRADIATED AND CONTROL BEAGLES R. M. Johnson p 30–43 ref

5. OPTHALMOSCOPIC EXAMINATION OF THE EXPERIMENTAL BEAGLE W. G. Magrane p 44–49 refs

6. CARDIOVASCULAR DISEASE IN AGEING CONTROL AND IRRADIATED BEAGLES R. M. Johnson p 50–73 refs

7. DEVELOPMENT OF A PSYCHOLOGICAL FIELD RESEARCH PROGRAM A. K. Solarz p 74–85 refs

8. PSYCHOLOGICAL STUDIES: DYADIC DOMINANCE-SUBMISSION PATTERNS IN FEMALE BEAGLE DOGS S. K. Solarz p 86–97 refs

9. THE EFFECT OF TOTAL BODY IRRADIATION ON REPRODUCTION A. C. Andersen p 98–128 refs

10. PATHOLOGY REPORT ON EXPERIMENTAL BEAGLES A. C. Andersen p 128–274 refs

11. EXPERIMENTAL DOG SURVIVAL A. C. Andersen p 275–280 ref

N64-12113 Los Alamos Scientific Lab., N. Mex.

HEALTH PHYSICS PLANNING FOR A HIGH-PRESSURE TRITIUM GAS EXPERIMENT AT A UNIVERSITY

Morris J. Engelke 15 Nov. 1963 34 p ref
(Contract W-7405-eng-36)
(LAMS-2959) OTS: $0.75

This paper is concerned with the problems encountered in the use of a multicurie high-pressure tritium gas target at a large university. The necessary administrative arrangements, state licensing, transportation, and health physics problems are discussed. Author

N64-12123 Columbia U., New York, N.Y. Radiological Research Lab.

Annual Report of Research Project [RADIOLOGICAL PHYSICS, BIOPHYSICS, AND RADIOLOGY]

H. H. Rossi Oak Ridge, Tenn., AEC, Div. of Tech. Inform., 1 Jan. 1963 200 p refs
(Contract AT(30-1)-2740)
(NYO-10451) OTS: $3.00

Research activities in radiological physics include: (1) dosimetry—dosimetry of monoenergetic neutrons, gas multiplication chamber for radiation measurement, dosimetry for irradiation of tissue culture cells, and dosimetry of 3 Mev; (2) measurements of microscopic distribution of radiation energy—local energy density, computer applications, and tissue equivalent proportional counter and gas-flow system; and (3) radiation protection—measurement of dose equivalent (RBE dose) in mixed radiation fields and ancillary problems. Activities in biophysics included: (1) RBE studies with monoenergetic neutrons; (2) radiation effects on cells in tissue culture; (3) UV-induced mutations in bacteria, radiation-sensitive and radiation-resistant bacterial mutants; and (4) spontaneous mutation rate and aging in *Drosophila melanogaster*. Research activities in radiobiology are also discussed. P.V.E.

N64-12132 Argonne National Lab., Ill.

A REVIEW OF THE ARGONNE NATIONAL LABORATORY RADIATION EXPOSURE EXPERIENCE FOR THE YEARS 1959-1961

Pete Tedeschi Feb. 1963 41 p refs
(Contract W-31-109-eng-38)
(ANL-6688) OTS: $1.00

A general analysis of experience with radiation exposure of employees was made by means of machine-processed records. Distribution of employee exposures according to age, years of employment, laboratory division, job group, and sex were determined for a 3-year period. A 23.6% increase in the number of employees monitored occurred from 1959 to 1961. The number of measurable exposures increased 107%. The greatest influence on the increase in measurable exposure was probably due to a change to a more sensitive film and from a 1-week to a 2-week film-wearing period. Evaluation of performance using the factors frequency rate, exposure rate, and average exposure reveals that the Radiation Safety Program is improving in effectiveness. The exposure rate has been reduced by as much as 71.1%, and the average exposure was reduced 42.4%. Author

N64-12139 Joint Publications Research Service, Washington, D.C.

EXCERPTS FROM VOL. 28 OF THE BOL'SHAYA MEDITSINSKAYA ENTSIKLOPEDIYA (GREAT MEDICAL ENCYCLOPEDIA) [MOSCOW 1962]

V. Spasskiy et al 10 Dec. 1963 29 p refs Transl. into ENGLISH p 158–160, 256–266, and 452–456
(JPRS-22213; OTS-63-41330) OTS: $0.75

Descriptions, as they appear in the *Great Medical Encyclopedia*, of air regeneration, roentgen, roentgen machines, and respirators are presented. P.V.E.

N64-12142 Joint Publications Research Service, Washington, D.C.

ELECTROCARDIOGRAPHY IN SPORTS MEDICINE

Lev Alekseyevich Butenko 31 Dec. 1963 24 p Transl. into ENGLISH of portions of a book "Elektrokardiografiya v sportivnoy meditsine", Leningrad, Medgiz, 4 Mar. 1963 p 3–19, 124–126, and 208
(JPRS-22508; OTS-64-21154) OTS: $0.75

Electrocardiographic examination is an aid in determining the state of the general and specific training of the organism and in evaluating physical training methods. The capabilities of electrocardiography are realized in the overall complex of medical examinations more fully when, apart from standard leads, unipolar chest leads, augmented unipolar limb leads, and Nebo leads are recorded after and during the performance of exercise. In addition, a determination of the "electrical position" of the heart and an axonometric analysis of the electrocardiogram should be made. Pronounced shifts (variants) occur in the functional and morphological condition of the heart in the process of athletic training. These variants are not noted in the hearts of athletes. Covered under these peculiarities of the electrocardiogram may be not only variants of the normal and functional heart condition but also prepathological and pathological changes. In view of this, in each concrete case before calling a particular characteristic of an athlete's electrocardiogram a variant of the norm, it must be proved that this characteristic is not pathological. I.v.L.

N64-12144 Joint Publications Research Service, Washington, D.C.

THE GNOSIOLOGICAL NATURE OF INFORMATION MODELLING

V. M. Glushkov 31 Dec. 1963 11 p Transl. into ENGLISH of an article from Voprosy Filosofii (Moscow), no. 10, Oct. 1963 p 13–18

(JPRS-22518; OTS-64-21163) OTS: $0.50

Information modeling is based on the fixation of a certain level of cognition of an object, making it possible not only to describe its structure but also to predict (with varying degrees of accuracy) its behavior. Electronic computers, like the brain, are universal instruments for information modeling. Any dynamic information model can be realized with them provided the memory component is sufficiently large. The demonstration of the property of universality possessed by electronic computers is based on two fundamental ideas. The first idea is that of coding the alphabets of any language in the alphabet of one particular language. The second idea is the breaking down of the arbitrary rules for the transformation of information into elementary rules. The problem of an information model of the brain is very important in terms of the epistemological theory. The theoretical possibility of building such models of the brain, with any degree of accuracy desired, must be acknowledged. I.v.L.

N64-12145 Joint Publications Research Service, Washington, D.C.

LEUKOSIS AND RADIATION

Ye. D. Gol'dberg 31 Dec. 1963 7 p Transl. into ENGLISH of the conclusion and table of contents of a book "Leykozy i Radiatsiya", 1963 p 61–65

(JPRS-22520; OTS-64-21165) OTS: $0.50

The development of leukoses can be put into a pathogenetic relationship with the occurrence of the mutational process in hemopoietic organs and cells of the reticuloendothelial system which creates a systemic hyperplasia of the neoplastic type. There is no doubt that ionizing radiation plays the role of a powerful mutagenic agent, the effect of which is proportional to the dose received. Apparently, whole-body irradiation, single and fractionated, and local segmental irradiation are equally dangerous. A formula is presented for calculating the total number of possible cases of leukosis. According to this formula, it is indicated that if nuclear weapons testing is continued, there will be more than 200,000 cases of leukemia per year. I.v.L.

N64-12146 Joint Publications Research Service, Washington, D.C.

THE MAIN TRENDS IN THE SYNTHESIS OF ANTIHYPERTENSIVE DRUGS

M. V. Rubtsov 31 Dec. 1963 14 p refs Transl. into ENGLISH of an article from Med. Prom. SSSR (Moscow), v. 17, no. 10, Oct. 1963 p 6–14

(JPRS-22524; OTS-64-21169) OTS: $0.50

A review of the main trends in the synthesis of antihypertensive agents is presented. A characterization is given of the most important preparations belonging to the following groups: (1) preparations with a central effect; (2) ganglion blocking preparations; (3) adrenolytics; (4) sympathicolytics; and (5) antispasmodics. R.T.K.

N64-12149 Joint Publications Research Service, Washington, D.C.

THE HUMORAL COMPONENT IN THE EFFECT OF BONE MARROW TRANSPLANTATION ON DOGS WITH ACUTE RADIATION SICKNESS

Chang Ts'ung-hsien 3 Jan. 1964 10 p refs Transl. into ENGLISH of an article from Med. Radiol. (Moscow), v. 8, no. 8, Aug. 1963 p 48–53

(JPRS-22591; OTS-64-21200) OTS: $0.50

Experiments were performed on nine dogs irradiated with a dose of 600 r ($LD_{95/45}$). The dose rate was 18 to 22 r/min. Three dogs served as the control group. Six dogs were injected intravenously, 2 days after irradiation, with the bone marrow from donor dogs. Results indicate: (1) The functional activity of bone marrow was clearly lower in the experimental dogs than in the control and was largely restored within 20 to 30 days. (2) The Moeschlin test (an intravenous pyrogen injection) on the two control dogs tested was characteristically negative on the fifth day after irradiation. This test on two of the three experimental dogs tested showed a definite leukocytosis (39% and 59% increase in the leucocyte count). (3) A suspension of destroyed bone marrow cells contains some humoral factor that stimulates the restoration of hematopoiesis in irradiated dogs and mitigates the course of acute radiation sickness. (4) The humoral factor has a more pronounced effect on leukopoiesis and thrombopoiesis than on erythrocytopoiesis. From these results it can be concluded that bone marrow transplantation definitely stimulates blood formation in the recipient. I.v.L.

N64-12176 School of Aerospace Medicine, Brooks AFB, Tex.

CONTINUOUS FUNCTIONAL TESTING OF OXYGEN BREATHING EQUIPMENT

J. Ryan Neville Aug. 1963 13 p refs

(SAM-TDR-63-56; AD-422773)

A method is described for the continuous functional testing of aviator's oxygen breathing equipment. By use of an oxygen detector that fits in the mask, recordings were made of changes in oxygen partial pressure in going from automix to 100% oxygen. The results obtained were compared with the expected change, and conclusions were drawn concerning the fit and functioning of the oxygen mask. The detector was also used to monitor the oxygen concentration delivered by the regulator, and comparisons were made of several different types of oxygen regulators. Author

N64-12214 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio

EMERGENCY LIFE SUSTAINING SYSTEM FOR SPACECRAFT Final Report

Henry W. Seeler Sep. 1963 14 p refs

(AMRL-TDR-63-82; AD-423799)

A concept for a complete emergency life sustaining system for use during failure of the normal pressurization system in a spacecraft is advanced. The system includes four components: (1) an astronaut's uniform with a built-in mechanical pressurization system; (2) a pressure-breathing demand-regulator; (3) an automatically actuated system of solid chemical oxygen candles; and (4) a one-man compression tube. This system has been partially fabricated and appears worthy of further development. Author

N64-12215 Institute of Occupational Health, Helsinki (Finland)
EFFECTS OF EXPOSURES TO EXTREMELY HOT ENVIRONMENTS ON TEMPERATURES OF THE TYMPANIC MEMBRANE, THE OESOPHAGUS, AND THE RECTUM OF MEN
Pekka Piironen Wright-Patterson AFB, Ohio, Biomed. Lab., Oct. 1963 52p refs
(AF EOAR GRANT 62-31)
(AMRL-TDR-63-85; AD-424409) OTS: $1.50

The esophageal, tympanic, and rectal temperatures of resting nude human subjects were investigated in extremely hot thermal environments ranging from 50° to 130° C (120° to 265° F). Changes in temperatures in the esophagus and at the tympanic membrane appeared rapidly, were linear, and were of equal magnitude. They were considered to follow closely the blood temperature in the central circulation. The simultaneous changes in the rectal temperature were slow and irregular. Author

N64-12216 Inst. of Occupational Health, Helsinki (Finland)
THERMAL EXCHANGES OF THE HUMAN BODY IN EXTREME HEAT Technical Documentary Report [Nov. 1961-Dec. 1962]
Erkki Aikas and Pekka Piironen Wright-Patterson AFB, Ohio, Biomed. Lab., Oct. 1963 50 p refs
(Grant AF-EOAR-62-31)
(AMRL-TDR-63-86; AD-424396)

Seven nude men were exposed supine to various environmental temperatures ranging from 50° to 130° C (120° to 265° F). The respiratory heat exchange, the metabolic heat production, the change in the body heat content, and the coefficient for evaporative heat transfer were determined. The radiating surface area and coefficient for convective heat transfer were calculated by using the method of partitional calorimetry. The mean values obtained for the coefficients of evaporation and convection were $11.3\sqrt{v}$ kcal/m^2 h mm Hg and $6.8\sqrt{v}$ kcal/m^2 h° C (v in m/s), respectively. The radiation area factor determined was 0.49. Author

N64-12219 John B. Pierce Foundation of Connecticut, New Haven
REDUCED SET POINT TEMPERATURE IN EXERCISING DOG
Donald C. Jackson and Harold T. Hammel Wright-Patterson AFB, Ohio, 6570th Aerospace Medical Research Labs., Oct. 1963 20 p refs
(Contract AF 33(657)-7603)
(AMRL-TDR-63-93; AD-424541) OTS: $0.50

Experiments were performed on dogs to test the hypothesis of an elevated set point temperature in exercise. Measurements of rectal, hypothalamic, and skin temperatures and respiratory evaporative heat loss were made on dogs at rest and during exercise on a level treadmill at 4 mph. Local hypothalamic heating and cooling during exercise, using surgically implanted thermodes, were performed on two dogs to confirm the temperature sensitivity of the hypothalamus of the exercising dog. Comparisons of evaporative heat loss during rest and exercise revealed much greater loss during exercise than at rest at the same hypothalamic temperatures. In experiments at low ambient temperatures, between 10° and 17° C, internal body temperatures were often the same or lower during exercise than during the preceding rest period, although panting and vasodilatation were observed during exercise in contrast to shivering and vasoconstriction during the rest period. These observations lead to the conclusion that the set point temperature in trained, exercising dogs is lowered from the resting level. Author

N64-12226 General Electric Co., Valley Forge, Pa. Missile and Space Div.
RESEARCH STUDY OF THE BIOMEDICAL ASPECTS OF THE PROPOSED AEROSPACE ENVIRONMENTAL CHAMBER
W. Olewinski, T. Marton, L. Wilder, R. Knipe and N. Belasco et al Arnold Eng. Dev. Center, Dec. 1963 235 p refs
(Contract AF 40(600)-1012)
(AEDC-TDR-63-256; AD-424461)

The major portion of the study considers the chamber where man will be introduced as a member of the crew of a test vehicle or, if necessary, to rescue personnel inside the chamber in case of emergency. Emergency chamber repressurization was not considered acceptable for rescue purposes. This portion of the study describes the emergencies and rescue procedures to be used in the chamber. Equipment including manipulators, pressure suits, pressurized capsules and associated life support equipment, transport equipment, personnel locks, and biomedical equipment were studied for use in the chamber. Recommended system concepts, operational procedures, and manpower requirements are outlined. During the last portion of the study different ground rules were considered (i.e., repressurization was considered for rescue). The study describes possible vehicle malfunctions which might lead to emergencies, physiological emergencies, and resulting rescue requirements. Simplified equipment concepts to provide for rescue of the test vehicle crew are also described. Author

N64-12246 USAF School of Aerospace Medicine, Brooks AFB, Tex.
A WATER RECYCLING SYSTEM FOR USE IN SEALED ENVIRONMENTS
John Hargreaves, Thomas E. Morgan, Jr., and B. E. Welch Oct. 1963 8 p refs
(SAM-TDR-63-60; AD-424120)

Production of potable water by a vacuum distillation process that was used during several experiments in a two-man space cabin simulator is discussed. Wash water, condensate collected from the relative humidity control coils, and urine were collected by simulator crew occupants and processed through a vacuum distillation apparatus on board the simulator, to supply drinking water for crew members during experiments lasting 17 days and 30 days. Author

N64-12254 Naval Radiological Defense Lab., San Francisco, Calif.
ENVIRONMENTAL STUDIES OF A 100-MAN UNDERGROUND SHELTER
R. H. Heiskell 1 Aug. 1963 75 p refs
(Contract CDM-SR-59-54)
(USNRDL-TR-618; AD-422534)

Temperature studies were conducted during both simulated and human occupancy tests on the 100-man shelter. The temperature of the shelter remained comfortable during 14 days of

human occupancy. The ventilating air movement through the shelter designed for 16 cfm per occupant was adequate to reduce the carbon monoxide concentration from heavy smoking to below safe tolerance limits and it removed 69% of the heat generated by the occupants with only 31% of the heat being dissipated through the walls. The shelter temperature varied between 74° and 90° F with an outside air temperature of 50° to 94° F during the simulated occupancy test and between 70° and 82° F during the human occupancy tests with an outside air temperature of 36° to 67° F. Poor distribution of the inlet air resulted in uncomfortably cool areas in the front of the shelter during the human occupancy test. Author

N64-12255 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.

THE COMPOSITION OF MITOCHROME AND CYTOCHROME OXIDASE FROM RAT LIVER MITOCHONDRIA

Herman W. Schmuckler 21 Oct. 1963 222 p refs

(NADC-MA-6319; AD-424100; Bu. Med. and Surgery Rept. 22)

Purified preparations of mitochrome and cytochrome oxidase from rat liver mitochondria were subjected to chemical analysis to determine whether these two proteins are similar. The large differences in their amino-acid composition as well as the absence of copper in mitochrome and its presence in cytochrome oxidase and the presence of ethanolamine in mitochrome and its absence in cytochrome oxidase allow only one conclusion: mitochrome and cytochrome oxidase are different proteins and it is highly unlikely that mitochrome is derived from aged preparations of cytochrome oxidase. Author

N64-12256 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.

PILOT BIOMEDICAL AND PSYCHOLOGICAL INSTRUMENTATION FOR MONITORING PERFORMANCE DURING CENTRIFUGE SIMULATIONS OF SPACE FLIGHT

Randall M. Chambers 18 Oct. 1963 34 p refs

(NADC-MA-6308; AD-42430; BuMed. and Surgery Rept. 3)

This report presents some of the results of recent centrifuge acceleration research and training projects in which the biomedical, psychophysiological, and psychological performances of pilots were monitored and measured. Monitoring and recording instrumentation techniques are described, and an attempt is made to identify and quantify some of the capabilities and limitations of pilot performance during exposure to accelerations which vary in magnitude, duration, direction, rate of onset, and profile complexity. Apparatus and methods are presented and discussed for monitoring visual disturbance, discrimination and response behavior, and complex skill behavior, and an approach is made to the problem of monitoring higher mental functioning. Author

N64-12270 Rochester U., N.Y.

MICROWAVE MODIFICATION OF X-RAY LETHALITY IN MICE

R. A. E. Thomson, S. M. Michaelson, and J. W. Howland

Griffiss AFB, N.Y., Human Eng. Lab., Aug. 1963 12 p refs

(Contract AF 30(602)-2921)

(RADC-TDR-63-352; AD-424411)

Fourteen and thirty days after mice received 2800-Mc pulsed microwave treatment, they were subjected to 250kvp whole-body X-irradiation at dose levels of 700r, 800r, and 900r. These dose levels are the thirty-day LD30, LD75, and LD95 values for normal mice. Evidence of reduced lethality and tendency for longer survival times in the microwave pretreated mice, compared with that of normal X-irradiated mice, is presented. Author

N64-12321 School of Aerospace Medicine, Brooks AFB, Tex.

EFFECTS ON MAN OF PROLONGED EXPOSURE TO OXYGEN AT A TOTAL PRESSURE OF 190 MM. HG

Thomas E. Morgan, Jr., Frode Ulvedal, Ralph G. Cutler, and B. E. Welch Sep. 1963 10 p refs

(SAM-TDR-63-52; AD-423948)

Four 17-day experiments were conducted on healthy pilots in the two-man space cabin simulator. Total pressure averaged 192 mm Hg; partial pressure of oxygen, 174 mm Hg. This atmosphere was reasonably well tolerated by all test subjects. The symptoms consisted of irritation of the upper respiratory tract, aural atelectasis, and eye irritation. Postexperimentally, 2 of the 8 subjects demonstrated reduced arterial oxygen saturation immediately. Pictures, however, gave no X-ray evidence of pulmonary atelectasis. The incidence of baropathies following decompression from 750 mm Hg to 190 mm Hg exceeded 50% (5 of 8 subjects), even following 2 to 3 hours of preoxygenation. The utilization of an atmosphere consisting of oxygen, carbon dioxide, and water vapor at a total pressure of 190 mm Hg appears to be physiologically feasible, at least for 17 days. Author

N64-12340 School of Aerospace Medicine, Brooks AFB, Tex.

STUDIES WITH A SIMULATED MARTIAN ENVIRONMENT. GERMINATION AND GROWTH OF BACTERIAL SPORES

Thomas L. Roberts and Laurence A. Irvine Sep. 1963 10 p refs

(SAM-TDR-63-75; AD-424189)

Simulated Martian microenvironment containing 8% moisture permitted germination and growth of endospores of *Clostridium sporogenes*. Author

N64-12346 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.

"IN VIVO" MEASUREMENT OF TOTAL GAS PRESSURE IN MAMMALIAN TISSUE

Michael T. Lategola Jul. 1963 9 p refs

(CARI-63-11)

An *in vivo* method for the quantitative estimation of total gas pressure in mammalian tissue has been established. This method utilizes a rigid-walled capsule specially constructed to be permeable to oxygen, carbon dioxide, and nitrogen (O_2, CO_2, and N_2), but negligibly permeable to water vapor. The results obtained at equilibrium, after subcutaneous implantation of this capsule, demonstrate directly that the total gas pressure in the adjacent tissue, which is represented by the intracapsular total gas pressure, is about 40 to 50 mm Hg less than the concomitant atmospheric pressure. The difference between these gas pressures is a result of the metabolic gas exchange and may, therefore, be used to detect quantitative changes in tissue gas metabolism. Author

N64-12356 Joint Publications Research Service, Washington, D.C.

SOME RECENT DEVELOPMENTS IN MEDICAL RADIO ENGINEERING AND ELECTRONICS ABROAD

I. Kozumplik et al 31 Dec. 1963 12 p refs Transl. into ENGLISH of 2 articles from Med. Prom. SSSR (Moscow), v. 17, no. 10, Oct. 1963 p 55–58 and 62–64

(JPRS-22551; OTS-64-21179) OTS: $0.50

CONTENTS:

1. DEVELOPMENTAL PROSPECTS OF MEDICAL ELECTRONICS IN CZECHOSLOVAKIA I. Kozumplik p 1–5

2. REVIEW OF THE BOOK MIKROAPPARATURA DLYA REGISTRATSII PO RADIO NEKOTORYKH FIZIOLOGICHESKIKH FUNKTSIY (MICROAPPARATUS FOR RECORDING SOME PHYSIOLOGICAL FUNCTIONS BY RADIO) T. Ye. Timofeyeva p 6–9 ref

N64-12357 Joint Publications Research Service, Washington, D.C.

PROBLEMS OF THE MECHANISM OF THE BIOLOGICAL EFFECT OF MICROWAVES

A. S. Presman 2 Jan. 1964 27 p refs Transl. into ENGLISH of an article from Vsp. Sovrem. Biol. (Moscow), v. 56, no. 2(5), Sep.–Oct. 1963 p 161–179

(JPRS-22580; OTS-64-21190) OTS: $0.75

An analysis of clinical and experimental data on the effect of microwaves on human and animal organisms shows that, in the nature of the manifestations, three main types of this effect can be distinguished. The first type (reversible effect of microwaves) is expressed in the form of functional changes in the human or animal organism. The second (irreversible effect of microwaves) consists of organic changes in tissues and organs. The third type (specific effect of microwaves) consists of such reactions to microwave irradiation that denote the presence of the capacity for special microwave reception in animals, as well as the reception of electromagnetic waves in other sections of the radiofrequency spectrum. Within the framework of this classification, an analysis is made of the possible nature of the primary physiological and biophysical–chemical processes underlying the biological effect of microwaves. I.v.L.

N64-12366 School of Aerospace Medicine, Brooks AFB, Tex.

STRESS IN DENTAL PATIENTS. ADRENOCORTICAL RESPONSES IN PATIENTS SCHEDULED FOR OPERATIVE DENTISTRY AND FOR IMPACTION SURGERY

Ira L. Shannon, Walter V. Davis, Lucian Szmyd, (AF Hospital, Lackland AFB), and John R. Prigmore (Utah U.) Feb. 1963 6 p refs

(SAM-TDR-63-11; AD-403651)

Serum free 17-hydroxycorticosteroid levels were determined for 1,700 systemically healthy, young adult males divided into the following groups: One thousand subjects were included in a physiologic baseline study; one control group of 209 subjects was sampled over a 21-week period; a second control group of 248 participants was studied along with 97 patients scheduled for operative dentistry and 146 patients appointed for impaction surgery. All samples were collected between 7:30 and 8:00 a.m. In the baseline study a serum free 17-OHCS mean of 14.82 (SD = 3.91) μg./100 ml. was found. The means for the two control groups were not significantly different. Variances for these groups did differ ($P < .05$). The anticipation of having a tooth filled was a significant ($P < .05$) stimulus to the adrenal cortex, but an appointment for impaction surgery produced a significantly greater response ($P < .001$). Author

N64-12384 Air Force Systems Command, Wright-Patterson AFB, Ohio

PROBLEMS OF CYBERNETICS (SELECTED ARTICLES)

N. B. Demidovich and V. I. Levenshteyn 16 Aug. 1963 51 p refs Transl. into ENGLISH of two articles from Probl. Kibernetiki (Moscow), no. 5, 1961 p 105–136

(FTD-TT-63-544/1+2+4; AD-415169) OTS: $4.60

A group-code theory and the application of the Hadamard matrix to a single problem of coding are discussed. The group-code theory deals with the question of the existence and uniqueness (to within equivalence) of group codes with a given distance matrix. The problem is reduced to the existence of whole-number nonnegative solutions of an algebraic system of equations with a known matrix (universal matrix) which depends only on the power of the code. It is demonstrated that the distance matrix determines a code which is unique in a certain sense. The Hadamard matrix is applied to the following problem which arises in the theory of error-detecting and error-correcting codes. There is a set of 2^n different n-digits sets of 0 and 1. The distance between two sets is defined as the number of digits in which they occur. The subset of binary sets (the code) is characterized by the following parameters: n is the length of the code sets; d is the minimum distance between the code sets; M is the number of code sets (the power of the code). The maximum power of a code with the parameters n and d is denoted by M(n, d). It is required for a given n and d to construct a code of M(n, d) sets (a maximum code). I.v.L.

N64-12392 Joint Publications Research Service, Washington, D.C.

STUDY OF CORTICAL REGULATION OF THE WATER AND ELECTROLYTE BALANCE

Z. T. Tursunov 31 Dec. 1963 10 p Transl. into ENGLISH of the Table of Contents and the conclusion of a book "Korkovaya Regulyatsiya Vodno-Solevogo Obmena", Tashkent, 1963 p 144–151

(JPRS-22523; OTS-64-21168) OTS: $0.50

Study was conducted of water and salt metabolism, and the role of the cerebral cortex in its regulation, under conditions of insolation and high temperature. It was determined that irradiation of healthy dogs causes considerable disorders of the water and salt balance, the degree and nature of which depend on the number of times to exposure and the duration of the high-temperature effect. The greatest changes were noted, as a rule, only at the beginning of the first course of irradiation. C.L.W.

N64-12393 Joint Publications Research Service, Washington, D.C.

NEW TYPES OF CHROMOSOME REARRANGEMENT DEVELOPING IN THE MICROSPORES OF TRADESCANTIA PALUDOSA UNDER THE INFLUENCE OF SEVERAL FACTORS OF SPACE FLIGHT

N. L. Delone et al 3 Jan. 1964 11 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSSR (Moscow), v. 152, no. 5, 1963 p 1227–1230

(JPRS-22585; OTS-64-21194) OTS: $0.50

An analysis was conducted of the chromosome rearrangement in the microspores of *Tradescantia paludosa* under the influence of several factors of spaceflight. Chromosome rearrangement was detected in microspores of *Tradescantia paludosa* on board the Vostok-3 and the Vostok-4 spaceships. The most prevalent type of chromosome rearrangement detected during these flights develops also in experiments concerning the influence of acceleration. The microspores on the Vostok-4 were in a more sensitive phase than the microspores on the Vostok-3, but the percentage of chromosome rearrangement was higher in the Vostok-3 variation. These two circumstances result in the assumption that the chromosome rearrangements detected are caused by dynamic factors and consequently a more prolonged flight will not provoke the enhancement of the genetic effect. C.L.W.

17 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control, and materials fabrication, handling and inspection. *For related information see*: 06 Auxiliary Systems.

N64-11441 Aerospace Corp., El Segundo, Calif.
HOT PRESSING OF TUNGSTEN POWDER
J. E. White and M. M. Jurkowitz 22 Aug. 1963 44 p refs
(Contract AF 04(695)-269)
(SS-TDR-63-196; TDR-269(4240-10)-1; AD-424203)

A hot pressing study was conducted on two grades of pure tungsten with a 2-μ and 20-μ average particle size, and on a 4-μ tungsten powder containing 1 volume percent thoria (ThO_2). Hot pressing was conducted in ATJ graphite dies under pressures up to 8000 psi and at temperatures from 1400° to 1800° C (2550 to 3270° F). The final density of all three grades of tungsten powder increased continuously with increasing temperature and pressure. Final density, grain size, and hardness were correlated with initial powder particle size and the presence of a second phase. The formation of the tungsten-carbide case, inherent for hot-pressing in graphite, was followed as a function of time, temperature, pressure, and initial powder size. Author

N64-11458 American Power Jet Co., Ridgefield, N.J.
ELECTROMECHANICAL COMPONENT RELIABILITY
George Chernowitz, James M. Ciccotti, Angelo W. Castellon, and Gerald L. Geltman May 1963 421 p refs
(Contract AF 30(602)-2652)
(APJ 309-1; RADC-TDR-63-295; AD-423327)

The reliability of mechanical and electromechanical components is investigated from physical and mechanisms-of-failure points of view, with the goal of improved design practice and specification requirements. Sixteen components applicable to ground electronic systems are studied in detail: actuators, bearings, cables, clutches, counters, couplings, elec. connectors, fasteners, gears, motors, potentiometers, relays, rheostats, solenoids, switches, and synchros. Author

N64-11479 Joint Publications Research Service, Washington, D.C.
SOME ASPECTS OF THE HYDROSTATIC PRESSING OF POWDERS
M. Yu. Bal'shin and A. P. Dubrovskiy *In its* Articles on Soviet Powder Metallurgy 28 Mar. 1963 p 1–5 refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 136, no. 2, 11 Jan. 1961 p 332–335 (See N64-11478 03-01) OTS: $0.50

The effects of hydrostatic pressing and conventional pressing on powders of Cu, Fe, Ni, and Mo were compared. Results indicate: (1) Hydrostatic pressing, as shown by the relative density of the pressed powders as a function of pressure, is more effective than the conventional method. The reduction in the pressure required is especially pronounced for fine and hard metals (Ni and Mo) where the hydrostatic pressure need be 30% to 50% less to give the same density. The reduction in pressure for Cu was 20% to 30%, whereas for Fe, the reduction was from 10% to 20%. (2) A hydrostatically pressed material has the same strength in all directions while conventional pressing causes considerable anisotropy. The P_{max} differs little between hydrostatic and conventional pressing for soft metals (the absence of external friction is balanced by the higher internal friction) but is considerably less for the hard metals. I.v.L

N64-11480 Joint Publications Research Service, Washington, D.C.
A RADIATION METHOD OF PREPARING FINELY DIVIDED METALS AND OXIDES
G. M. Zhabrova, V. M. Kadenatsi, T. S. Azizov, A. A. Gordeyava, P. Ya. Glazunov et al *In its* Articles on Soviet Powder Metallurgy 28 Mar. 1963 p 6–8 refs Transl. into ENGLISH of an article from Izvest Akad. Nauk SSSR (Moscow), v. 9, Sep. 1962 p 1690–1692 (See N64-11478 03-01) OTS: $0.50

A radiation method for preparing finely divided metals and metal oxides was investigated using the hydroxides of Zr, Fe, Al, nickel oxalate, copper oxalate, and basic copper carbonate. The radiation source was the electron beam from a linear accelerator. Results indicate that: (1) Radiolysis of solid hydroxides, oxalates, and carbonates at low temperatures (not above 40° to 50° C) produces finely divided metals and oxides. (2) Metals and oxides produced by radiolysis have specific surfaces greatly exceeding those of the same materials when produced by pyrolysis. I.v.L

N64-11482 Joint Publications Research Service, Washington, D.C.
CAUSES OF LAMINATION CRACKS IN PRESSINGS MADE OF METAL POWDERS
A. N. Nikolayev *In its* Articles on Soviet Powder Metallurgy 28 Mar. 1963 p 16–18 refs Transl. into ENGLISH of an article from Izvest. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), no. 2, 1962 p 101–103 (See N64-11478 03-01) OTS: $0.50

Two dies were made of gray cast iron; one die was enclosed in a shroud made of Stainless Steel 3 in the hot state, the other was not shrouded. These dies were used with AM iron powder to press cylinders of various heights at a fixed pressure of 4 t/cm^2. All specimens from the unshrouded die showed cracks; but only the cylinders with the highest heights from the shrouded die showed cracks. These results indicate that the elastic stretching of the die and the elastic aftereffect in the specimen are the main causes of cracking. Stronger dies provide an effective means for minimizing cracking powdered-metal specimens, since these dies show less elastic deformation. I.v.L

N64-11483 Joint Publications Research Service, Washington, D.C.
PRESSING OF METAL POWDERS
S. Ya. Plotkin and G. V. Samsonov *In its* Articles on Soviet Powder Metallurgy 28 Mar. 1963 p 19–26 refs Transl. into ENGLISH of an article from Vestn. Nashinostr. (Moscow), no. 5, May 1959 p 53–56 (See N64-11478 03-01) OTS: $0.50

Some aspects of considerable importance in practical powder metallurgy were investigated. Results indicate that: (1) The density of Fe and W increases with the pressing time; the internal stresses are thereby reduced. (2) The elastic aftereffects of pressing, in the cases of Al and Cu, generally decrease as the grain size increases. With brittle materials, such as WC, the aftereffect increases only up to pressures insufficient to cause brittle fracture. (3) The repeated pressing and powdering of Cu and W cause a substantial increase in the density of the pressed product without any great increase in the internal stress and

elastic aftereffect. (4) The distribution of forces in the pressing of powders is very dependent on the seizure between the die and the powder, especially for low pressures and low rates of pressing. I.v.L.

N64-11600 Joint Publications Research Service, Washington, D.C.
DEVELOPMENTS IN STRIP ROLLING AND ELECTROSLAG RESMELTING
Ye. P. Ignashev et al 13 Dec. 1963 15 p refs Transl. into ENGLISH of 2 articles from Poroshkovaya Met., Akad. Nauk Ukr. SSR (Kiev), no. 3, (15), May–Jun. 1963 p 99–103 and Mashinostroenie (Kiev), no. 5, Sep.–Oct. 1963 p 78–81
(JPRS-22285; OTS-63-21018) OTS: $0.50

A technology was developed for strip rolling of molybdenum pressed billets sintered in a moist hydrogen atmosphere. The processes involved in electroslag resmelting are also discussed. R.T.K.

N64-11614 Joint Publications Research Service, Washington, D.C.
METHODS OF CORRECTION OF DYNAMIC ERRORS IN MACHINE-TOOLS WITH PROGRAM CONTROL
B. I. Andreychikov *In its* Transl. from Avtomat. i Telemekh. (Automation and Telemechanics) [Moscow], v. 23, no. 9, 1962 21 Feb. 1963 p 53–74 refs (See N64-11610 03-01) OTS: $2.25

To increase the accuracy of systems of program control of machine-tools with high productivity, it is necessary to use special methods of correction of dynamic errors. The methods are compared, and the most effective ones are stressed. Author

N64-11737 Thiokol Chemical Corp., Brigham City, Utah Wasatch Div.
STRIPLAP METHOD OF ROCKET MOTOR CASE FABRICATION Interim Technical Engineering Report, 7 Dec. 1963–6 Mar. 1963
T. B. Card Wright-Patterson AFB, Ohio, Manuf. Technol. Lab. Mar. 1963 20 p
(Contract AF 33(600)-42961)
(ASD-TR-7-912 (VII); AD-401136)

Techniques have been developed for brazing steel strip to the TU-193 motor case end rings which provide the requisite bond strengths. The techniques require varying mandrel rotation speeds and controlling the application of heat at various points during brazing to the end rings. Work has also started on a program in which braze alloys melting in the 700° to 900° F range will be selected and tested. Author

N64-11768 General Dynamics/Ft. Worth, Tex.
PRELIMINARY REPORT ON FABRICATION AND TESTS OF AN ELECTRO-DEPOSITED PRESSURE BOTTLE
C. H. Mooney, Jr. Wright-Patterson AFB, Ohio, AF Materials Lab., 4 Nov. 1963 14 p
(Contract AF 33(657)-11214)
(SR/D 61-2; AD-423216)

This report describes the fabrication and evaluation of an electrodeposited pressure bottle. The type of mandrel, surface preparation, electrodepositing solution, and current are discussed pertaining to fabrication. Pressure proof tests to establish structural capability, and thermodynamic tests to determine heat transfer coefficients, are also discussed in the report. Author

N64-11784 Joint Publications Research Service, Washington, D.C.
X-RAY DIFFRACTION ANALYSIS OF THE FIRST ORDER RESIDUAL STRESSES WHICH APPEAR DURING FINE MACHINING OF METALS
A. V. Poltavskiy and Yu. S. Terminazov 16 Dec. 1963 9 p refs Transl. into ENGLISH of an article from Izv. Akad. Nauk Kirg. SSR, Ser. Estestv. i Tekhn. Nauk (Alma Ata), v. 1, no. 3, 1959 p 45–50
(JPRS-22306; OTS-64-21033) OTS: $0.50

First order residual stresses in the surface layer of Steel 40, subjected to fine machining, were investigated by X-ray diffraction. Results indicate: (1) Fine machining caused the appearance of compressive first order residual stresses in the surface layer of the steel. (2) An increase in the rate of machining reduced the first order residual stresses; however, a tendency toward stabilization of the first order residual stresses was observed as the rate of machining increased. (3) Increasing the depth of cutting caused appreciable reduction of the stresses under consideration. (4) The delivery of the machining (in mm/rev) does not exert the same influence on the first order residual stresses. (5) All the parameters of fine machining considered exerted a vital influence on the magnitude of the compressive first order residual stresses. I.v.L.

N64-11788 Weapons Research Establishment (Australia)
SPUTTER-ION PUMPS WITH THERMIONIC ELECTRON INJECTION
E. H. Hirsch Oct. 1963 23 p refs
(Tech. Note CPD-74)

Experimental results are presented on sputter-ion pumps of both Penning and magnetron configuration, into which thermionic electrons are injected from an auxiliary source. Empirical laws are established connecting the pumping speed, magnetic field strength, anode potential, and pumping current. It is found that the injection of thermionic electrons allows the use of considerably lower magnetic field strengths and anode voltages than are required in a cold cathode pump of the same pumping speed. The results show that as an ion pump the Penning structure is a more efficient electrode arrangement than a magnetron geometry. Author

N64-11807 Phillips Petroleum Co., Idaho Falls, Idaho Atomic Energy Div.
EVALUATION OF THE METAL-TO-METAL CONTACT BASKET-TYPE ELECTROLYTIC DISSOLVER
H. T. Hahn, J. R. Aylward, and M. R. Bomer AEC Natl. Reactor Testing Station, 10 May 1963 41 p refs
(Contract AT (10-1) 205)
(IDO-14604) OTS: $1.00

Interchangeable baskets of niobium, titanium, and titanium clad on the interior surface with platinum–10 percent rhodium were used. Other modifications such as inclination, a cone insert, a trough, and a tapered annulus were adopted with some success. Continuous operation was demonstrated at the 200-amp level by promoting dissolution of the lowest element. The problem of discontinuity of operation, which is encountered with a niobium basket, was eliminated by the use of baskets made of titanium or lined with noble metal. Even with the latter materials, a gradually declining current occurs due to deteriorating contacts. Protection of the contact, as with a mercury pool, provides steady service, but this approach is limited by the inability to remove the heel from the protective layer. An analysis was made of the resistances encountered and an extrapolation of performance with full-scale elements attempted. Author

N64-11873 Joint Publications Research Service, Washington, D.C.

INVESTIGATION OF STRESSES WHEN PUSHING A TUBE THROUGH A DRAW PLATE

V. V. Shreykin and V. B. Slavin 24 Dec. 1963 16 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chern. Met. (Moscow), no. 8, 1963 p 72–81
(JPRS-22441; OTS-64-21110) OTS: $0.50

An investigation was made to determine the pushing stress on a tube as it is pushed through a draw plate. Dependence of the stress upon the degree of deformation of the tube's diameter, the wall thickness, the coefficient of outside friction, the plastic properties of the material, and the maximum taper angle of the draw plate at given conditions of the process is discussed. Formulas are developed for calculating the pushing stress, and calculated values are compared with experimental values. P.V.E.

N64-11920 Joint Publications Research Service, Washington, D.C.

DETERMINATION OF THE BATH TEMPERATURE IN THE ELECTROSLAG PROCESS BY THE CALORIMETRIC METHOD

G. A. Pertsovskiy 19 Dec. 1963 13 p refs Transl. into ENGLISH of an article from Simpozium Po Svarke, v. 2, 1959 p 156–162
(JPRS-22386; OTS-64-21076) OTS: $0.50

A procedure for determining the bath temperature, during electroslag welding, by the calorimetric method is described. Using this procedure, the average temperature of the metal bath was found to be 1640° C, while that of the slag bath was found to be 1635° C. I.v.L.

N64-11921 Joint Publications Research Service, Washington, D.C.

NEW CASTING METHOD FOR BALL-BEARING STEEL

G. N. Oyks et al 20 Dec. 1963 118 p refs Transl. into ENGLISH of the book "Novaye Tekhnologiya Vyplavki Sharikopodshipnikovoy Stal in Moscow State Sci. Tech. Publ. House of Ferrous and Nonferrous Met. Lit. 28 Jun. 1962 p 1–126
(JPRS-22390; OTS-64-21079) OTS: $2.50

A new technology for the production of ball-bearing steel in a metallurgical plant is described. A study of vacuum treatment of the metal as an intermediate technological step in melting is included. A description is given of the usual technology for making ball-bearing steel, and an evaluation is made of the new technology which yields better quality steel. The facilities used for vacuum treatment are described. Information is also presented on experiments performed to obtain ball-bearing steel without silicon by means of double vacuum treatment. R.T.K.

N64-11958 Hanford Atomic Products Operation, Richland, Wash.

ELECTRON BEAM WELDING OF NUCLEAR FUEL CLADDING COMPONENTS

R. F. Klein Oct. 1963 36 p
(Contract AT(45-1)-1350)
(HW-79143)

To investigate the problems and techniques involved in fabricating large, advanced nuclear fuel components from Zircaloy-2 material, several cladding pieces were designed and built using the electron beam process. These designs included five basic joint types for assembling the cladding. Destructive and nondestructive examinations were employed, including corrosion testing and extensive metallographic examination. Weldment size, "fit-up" of the parts to be joined, fixturing, and work carriage mechanisms, as they pertain to electron beam welding, are also discussed. The electron beam process has been demonstrated as a very satisfactory method for fabricating unusual fuel cladding. Fuel cladding components with lengths up to 8 ft have been fabricated for in-reactor irradiation. Author

N64-12000 European Atomic Energy Community, Brussels (Belgium)

FABRICATION OF SWAGED UO_2 FUEL ELEMENTS [HERSTELLUNG VON RUNDGEHAMMERTEN UO_2-BRENNELEMENTEN]

F. Hofmann, H. Kroll, and B. Liebmann Nuklear-Chemie und-Metallurgie GmbH (NUKEM), Wolfgang bei Hanau (W. Germany), Sep. 1963 22 p refs In GERMAN: ENGLISH Abstract
(Euratom Contract 001-60-5 RDD)
(EUR-353.d) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 40 BF

Four types of powders have been prepared by different methods. These are: (1) fused uranium dioxide, prepared by a continuous fusing process; (2) powders, prepared by high-temperature treatment of ADU (ammonium diuranate); (3) powders, made from uranium peroxide; and (4) UO_2-powders, which were improved by soaking with a solution of uranylnitrate and subsequent calcination. Fused powders and powders made from uranium peroxide reached the highest densities. For the fabrication of the fuel elements, the powders were tamped into stainless steel tubes of 18 mm OD. The tubes were evacuated, filled with argon, and sealed by welding the end closures. A two-die machine was used for swaging. A cold reduction of 20% to 30% in cross section, followed by a hot reduction at 750° C of 20% to 30% in cross section, yielded the highest UO_2-densities. With this method, densities between 85% to 94% TD have been reached. The density of the swaged UO_2 was determined by measuring weight and volume. The mean pore diameter in the swaged UO_2 was in the range of 1μ. Author

N64-12008 Joint Publications Research Service, Washington, D.C.

HEAT TREATMENT OF NIOBIUM

G. V. Zakharova and L. P. Zhorova 20 Dec. 1963 12 p refs Transl. into ENGLISH of an article from Tsvetn. Metal. (Moscow), May 1963 p 53–58
(JPRS-22404; OTS-64-21090) OTS: $0.50

An investigation was made of the influence of annealing on the content of the gases in niobium after smelting in an arc furnace, and of the impact strength of hot-deformed niobium and the mechanical properties of cold worked sheet niobium in furnaces with tungsten and graphite heating elements. The results indicated that: (1) annealing of ingots and large semimanufactured products can be done in furnaces with graphite heating elements at high temperatures (on the order of 1800° C to 2000° C), if the carbon saturated layer will be removed with further processing; and (2) annealing of semimanufactured products of niobium for recrystallization can be accomplished in furnaces with graphite heating elements at temperatures that do not exceed 1300° C. R.T.K.

N64-12010 Joint Publications Research Service, Washington, D.C.

SPOT WELDING OF SINTERED ALUMINUM POWDER WITH D16AT and AMg6 ALLOYS

G. F. Skakun and A. A. Chakalev 23 Dec. 1963 9 p Transl. into ENGLISH of an article from Avtomat. Svarka (Kiev), no. 8 (125), 1963 p 83–86
(JPRS-22422; OTS-64-21099) OTS: $0.50

Experimental electric spot welding of 1- and 1.5-mm-thick plates of SAP with D16AT- and AMg6-type aluminum alloys led to the following conclusions: (1) SAP material can be welded satisfactorily with aluminum alloys of the D16AT and AMg6 types. (2) Optimal procedures for welding plates 1 and 1.5 mm thick are established that ensure good quality of welded joints; the joints possess sufficient shearing and tensile strength. (3) Adhesion of the material to the electrodes is insignificant and permits welding up to 15 to 20 spots without cleaning of the electrodes. P.V.E.

N64-12011 Joint Publications Research Service, Washington, D.C.
PRODUCTION OF LARGE SIZE PIPES MADE OF OKH1ON-ZOT2 STAINLESS STEEL
O. A. Plyatskovskiy et al 24 Dec. 1963 16 p refs Transl. into ENGLISH of an article from Stal' (Moscow), no. 11, Nov. 1963 p 1024–1027
(JPRS-22444; OTS-64-21113) OTS: $0.50

A description is given of a method developed for production of thick-walled pipes, up to 300 mm in diameter and up to 10 m in length, from chromium-nickel-titanium steel, OKh1ON ZOT2. The pipes are produced by centrifugal casting of stocks of the steel with subsequent rolling in a pilger mill. Macrostructure and microstructure, as well as plastic characteristics of the metal, were investigated; a table of the mechanical properties is included. R.T.K.

N64-12079 Ampex Corp., Redwood City, Calif.
THE EFFECT OF EXTERNAL PRESSURIZATION ON SELF-ACTING FOIL BEARINGS
M. Wildmann and A. Wright Oct. 1963 34 p refs
(Contract Nonr-3815(00))
(RR 63-6; AD-424200)

The effects of introducing a small amount of lubricant under pressure into a self-acting foil bearing film are investigated. Foil shape and pressure distribution under the foil are obtained by combining the equilibrium equation with the Reynolds equation and solving the resulting equation. The results show that the effect of even small external pressurization in a self-acting foil bearing is very important. Author

N64-12091 Princeton U., N.J. Plasma Physics Lab.
A 19 INCH DIAMETER BAKEABLE METAL CERAMIC SEAL
K. F. Kirchner Oct. 1963 22 p refs
(Contract AT(30-1)-1238)
(MATT-228)

The hydride brazing process used for making a bakeable ceramic–metal assembly of 19-in. diameter and 42-in. long necessitated a reexamination of allowable thermal stresses, for the heating rate of the ceramic as well as a vacuum furnace with 700 liter volume at 1000° C. Mass spectrometer determinations were made of partial pressures above 350° C during the brazing cycle, when the titanium exists in a highly reactive state. The troublesome outgassing of internal heat reflectors, needed to prevent excessive temperature gradients in the ceramic, was avoided through judicious use of auxiliary external heaters rather than using exceedingly high pumping speeds. Author

N64-12143 Joint Publications Research Service, Washington, D.C.
INTRICATE INVESTMENT CASTING
V. M. Korolev and V. M. Stepanov 31 Dec. 1963 183 p refs Transl. into ENGLISH of a book "Fasonnoye lit'ye po vyplavlyayemym modelyam", Moscow, State Sci.-Tech. Publishing House, 1962 p 1–58
(JPRS-22509; OTS-64-21159) OTS: $3.00

The characteristic feature of investment casting is that the mold has no separation lines. In this method of casting, a ceramic coating 5 to 15 mm thick is applied to models, and the models are removed by melting, dissolving, or burning. The result is a shell with cavities of the desired shape and size. This book gives the results of many years of research and industrial experience in the investment casting of thin-walled large castings and wholly cast discs with blades from heat-resistant and high-strength steels. The process of making the ceramic refractory shell and the mold, and the preparation of the liquid metal are discussed. The mechanical and technological properties of high-strength steels and alloys and some of the characteristics of their solidification under various conditions are examined. I.v.L.

N64-12150 Joint Publications Research Service, Washington, D.C.
ON THE SUBJECT OF PROSPECTS FOR THE DEVELOPMENT OF CONTINUOUS TEEMING OF STEEL
B. V. Fitilev et al 3 Jan. 1964 10 p refs Transl. into ENGLISH of an article from Stal' (Moscow), no. 10, Oct. 1963 p 889–892
(JPRS-22594; OTS-64-21202) OTS: $0.50

An analysis of the data obtained in the operation of the vertical-type continuous steel-teeming unit, as well as corresponding design developments, shows the technical and economic expediency of the introduction of such units at operating and newly constructed plants. Author

N64-12323 Harry Diamond Labs., Washington, D.C.
A MECHANICAL POLISHING TECHNIQUE FOR SEMICONDUCTOR MATERIALS
R. B. Reams and C. H. Klute 30 Oct. 1963 22 p refs
(TR-1180; AD-423555)

A method for obtaining a very finely polished surface on semiconductor wafers has been devised. The mechanical arrangements include a polishing machine in which special care is used to continuously remove the abraded semiconductor particles from the polishing medium. The method uses only two major operations and yields a polished surface that is measurably smoother and flatter than the commercially polished specimens examined for comparison. Author

N64-12330 General Dynamics/Ft. Worth, Tex.
HYDRAULIC SYSTEM – ROYAL LUBRICANT FLUID, PARTIAL EVALUATION TEST
B. H. Mc Daniel 4 Nov. 1963 9 p
(Contract AF 33(657)-11214)
(FTDM-2907; AD-423066)

A partial evaluation was conducted to determine if Royal Lubricant Fluid, Royco 846, is a suitable alternate to Oronite 8515 in the B-58 hydraulic system. Comparisons were made between certain critical properties of Royco 846 and Oronite 8515; they showed that the fluids met applicable specification requirements with the exception of "O" ring compatibility, in which case Royco 846 had a more deleterious effect on Q2825-type "O" rings than did Oronite 8515. Results indicate that measured physical and chemical properties of Royco and Oronite are very similar and that they pass applicable specification requirements. J.R.C.

N64-12400* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
VACUUM LUBRICATION
K. E. Demorest 25 Jan. 1962 25 p refs
(NASA TM X-50798; MTP-P&VE-M-62-2) OTS: $2.60 ph, $0.95 mf

The problem of lubrication of guidance, control, and instrument-type bearings in space is under comprehensive study. This report describes the apparatus used in the study, the environment in which evaluations of inorganic dry film lubricants are being made, and a mathematical model designed to describe the failure mode observed in actual testing. The method of total problem solution is described, in actual testing. The method of total problem solution is described, and the status of current work is discussed in detail. Author

18 MATERIALS, METALLIC

Includes cermets; mechanical and physical properties of alloys and metals; and metallurgy. *For related information see*: 07 Chemistry; 17 Machine Elements and Processes; 19 Materials, Nonmetallic; 33 Stresses and Loads; and 34 Structural Design.

N64-11442 Air Force Systems Command, Wright-Patterson AFB, Ohio
ELEVATED TEMPERATURE FATIGUE PROPERTIES OF D6AC HIGH STRENGTH STEEL [Jan. 1960-Apr. 1963]
Sidney O. Davis Oct. 1963 31 p refs
(ASD-TDR-63-645; AD-423529)

A program was conducted to obtain complete stress versus number of cycles (S-N) curves for D6AC steel, heat treated to an ultimate strength of 270 ksi. Tension-tension fatigue tests were conducted on notched and unnotched specimens at 75°, 450°, and 550° F for stress ratios of 1 and ∞. Tensile and stress rupture data were obtained in conjunction with the fatigue data. Author

N64-11466 Aerospace Information Div. Library of Congress, Washington, D.C.
PRELIMINARY VARIANT OF THE PHASE DIAGRAM OF THE BORON-SILICON SYSTEM
G. V. Samsonov and V. M. Sleptsov 13 Nov. 1963 4 p refs Transl. into ENGLISH from Dlopovidi Akad. Nauk. Ukr., v. 8, 1962 p 1066-1068
(AID-T-63-119; AD-423724) OTS: $1.10 ph, $0.80 mf

The B-Si alloy systems were investigated by means of metallographic, X-ray diffraction, and visual thermal analyses. Alloys with a content of components differing by 0.5% to 5% were prepared by sintering of melting compacted mixtures, using an electrical-resistance furnace in an argon atmosphere. Results include the following: (1) The location of the solidus curve on the phase diagram of the B-Si system for alloys with a boron content up to 55 at. wt. pct. was marked according to a study of the temperature dependence of shrinkage of B-Si compacts of various compositions, and according to the metallographic determination of the moment of appearance of the liquid phase. (2) The liquidus curve of the B-Si system was plotted as a result of the determination of the melting temperatures. (3) An X-ray diffraction analysis of the B-Si systems containing 28 to 33 at. wt. pct. B does not show the presence of any phase with a crystal lattice different from the Si crystal lattice. (4) Brown single crystals, which correspond to the formula SiB_4, were obtained in B-Si alloys containing 70 to 80 at. wt. pct. These crystals were separated in the form of tetragonal lamellas and parallelepipeds with a crystalline lattice identical to that of B_4C. (5) B-Si alloys with a boron content higher than 85 at. wt. pct. have a complex lattice and correspond to SiB_6. I.v.L

N64-11468 Battelle Memorial Inst., Columbus, Ohio Defense Metals Information Center
A TABULATION OF DESIGNATIONS, PROPERTIES, AND TREATMENTS OF TITANIUM AND TITANIUM ALLOYS
R. A. Wood 15 Jul. 1963 11 p
(Contract AF 33(616)-7747)
(DMIC-Memo-171; AD-424412) OTS: $0.50

Data on titanium and titanium alloys include: (1) nominal composition; (2) producer's nomenclature; (3) forms available; (4) formability (minimum bend radius); (5) weldability; (6) melting temperature in F°; (7) recommended forging-temperature range F°; (8) beta transus temperature F° ±25F°; (9) recommended heat treatment; (10) typical tensile properties; (11) creep data; (12) stress rupture data; (13) fatigue data; (14) RT Charpy V impact ft-lb; (15) hardness; (16) usage; and (17) physical properties. I.v.L

N64-11481 Joint Publications Research Service, Washington, D.C.
WETTING AND IMPREGNATION OF BRIQUETTES OF TITANIUM AND ZIRCONIUM NITRIDES BY MOLTEN COBALT AND NICKEL
L. V. Beylina and I. P. Kislyakov *In its* Articles on Soviet Powder Metallurgy 28 Mar. 1963 p 9-15 refs Transl. into ENGLISH of an article from Izv. Vysshikh Uchebn. Zavedenii, Tsvet. Met. (Dzaudzhikau), no. 3, 1962 p 129-134 (See N64-11478 03-01) OTS: $0.50

The wetting and impregnation of briquettes of titanium and zirconium nitrides by molten cobalt and nickel were investigated in the light of producing hard, heat-resistant, and wear-resistant materials. Results indicate: (1) Titanium nitride is wetted by cobalt and nickel; the contact angles are much less than 90°. (2) Porous briquettes pressed from titanium nitride can be impregnated by molten cobalt and nickel. The purity and grain size are the controlling factors. Titanium nitride made from the high-purity metal can be impregnated reasonably completely by cobalt and nickel. (3) Zirconium nitride made from the metal is wetted by cobalt and nickel but is not impregnated. (4) Pseudobinary combinations of titanium nitride with nickel and cobalt may occur. These combinations appear to be eutectic, the nitride being of limited solubility in the metal in the liquid and solid states. I.v.L

N64-11526 Joint Publications Research Service, Washington, D.C.
ABOUT THE RELATIONSHIPS OF COERCIVE FORCES OF MAGNETICALLY-SOFT MATERIALS TO THE THICKNESS OF SHEET MADE FROM ROLLED POWDERS
O. A. Katrus *In its* Transl. from Fiz. Metal. i Metalloved. 13 Feb. 1963 p 1-5 refs (See N64-11525 03-01) OTS: $0.75

The dependence of coercive force upon the thickness of sheet strips produced by the rolling of a powder was investigated. The strips were rolled from carbonylic and reduced nickel powders, iron powder obtained from the reduction of APZhM scale, and from powdered Permalloy 65. Results include the following: (1) The dependence of coercive force, at room temperature, on the thickness of the strips was of the same nature with all the materials. Up to a thickness of 90 to 100 microns, the coercive force undergoes practically no change; from 90 to 100 microns to 30 to 40 microns, a smooth rise in the coercive force was observed; above 30 to 40 microns the coercive force

increased sharply. (2) The dependence of coercive force on thickness is not so well defined in the case of strips rolled from powder as in the case of strips produced by conventional methods. I.v.L.

N64-11536 Rock Island Arsenal Lab., Ill.
HEAT RESISTANT CONVERSION COATINGS FOR STEEL Interim Tech. Report
Linden H. Wagner 15 Aug. 1963 13 p refs
(Rept. 63-3345; AD-423682) OTS: $0.50

Zinc and cadmium oxides were dissolved in 75% phosphoric acid and used separately as stock phosphatizing solutions. They were diluted in the ratio of 1 to 4 and 1 to 8, by volume, or 1 to 15 by weight. Steel wool was dissolved therein to raise the iron content. Zinc and cadmium oxides were made into a slurry with water, converted to the nitrates, and added as accelerators. Steel panels were processed in the baths from 30 to 60 minutes at 190° to 195° F to obtain conversion coatings. The panels were divided into two groups. One group was used as the control, the other was heated in an oven at 300° F to determine heat resistance at that temperature. Both groups were evaluated by salt spray tests for their resistance to corrosion. It was found that cadmium coatings applied to the panels in the processing solutions, in the absence of iron and an accelerator, appeared to afford the best resistance to heat. Author

N64-11538 Army Missile Command, Huntsville, Ala.
MEASUREMENT OF THE THERMAL RESISTANCE OF URANIUM AND ALUMINUM FLAT SURFACES IN CONTACT
A. Ascoli and E. Germagnoli 6 Nov. 1963 15 p refs Transl. into ENGLISH by JPRS from Energia Nucl., 1961, v. 3, no. 1, p 23–31
(RSIC-99; AD-423770)

The measurements indicated that a value between 1° and 1.5° C/w/cm^2 can be used for the thermal resistance of U-Al surfaces in vacuum with heat fluxed between 50 and 60 w/cm^2. Thermal resistance values obtained in air were lower by a factor of 2 or 3 than those obtained in vacuum. The marked deviation of the values obtained in air from those obtained under vacuum indicated that with pressures less than 10^{-2} mm Hg the heat transfer took place according to Knudsen's theory, that is, the mean free path of the residual air molecules was presumably comparable to the distance between the two facing metallic surfaces, and thus the mechanism of mass conduction was markedly decreased in importance. P.V.E.

N64-11562* National Aeronautics and Space Administration, Washington, D.C.
THE SURFACE PROPERTIES OF IRON-CARBON ALLOYS [POVERKHNOSTNYYE SVOYSTVA SPLAVOV ZHELEZO-UGLEROD]
B. V. Tasarevskiy and S. I. Popel' Dec. 1963 12 p refs Transl. into ENGLISH of an article from Izv. Vysshikh Uchebn. Zavedenii Chern. Met. (Moscow), no. 8, 1960 p 15–21
(NASA TT F-149) OTS: $0.50

An effort is made to define more accurately the effect of carbon on the surface tension of iron and to determine the wetting of aluminum oxide and molten magnesium by iron–carbon alloys. From the values of the surface tension and the edge angles (θ), the bonding strength (adhesion) between the liquid and solid phase (W) is determined. Author

N64-11593 Los Alamos Scientific Lab., N. Mex.
TOTAL OPTICAL EMISSIVITY AND ELECTRICAL RESISTIVITY OF ($U_{0.3}$ $Zr_{0.7}$)C IN THE TEMPERATURE RANGE 1400° K TO 2800° K
L. D. Tatro and L. W. Miller 19 Nov. 1963 17 p
(Contract W-7405-eng-36)
(LAMS-2965) OTS: $0.50

The results of a rough measurement of total optical emissivity and electrical resistivity of a pin of ($U_{0.3}$ $Zr_{0.7}$)C prepared from a hot-pressed powder are presented. Since the measured properties are expected to depend on the method of sample preparation, the experimental results given here are probably true only for similarly prepared samples. In the temperature range 1400° to 2800° K, the measured total optical emissivity was 0.5 ±0.1, and the measured electrical resistivity in microohm cm may be represented by the equation $\rho = 150 + 5.7 \times 10^{-2}T$, where T is the Kelvin temperature. A discussion of the experiment is given that indicates some of the difficulties associated with this type of measurement. Author

N64-11742* Lear Siegler, Inc., Cleveland, Ohio Power Equipment Div.
BRUSHLESS ROTATING ELECTRICAL GENERATORS FOR SPACE AUXILIARY POWER SYSTEMS APPENDIX First Quarterly Report, 31 Oct. 1963
J. N. Ellis and F. A. Collins [1963] 155 p
(NASA Contract NAS3-2783)
(NASA CR-52916) OTS: $11.50 ph, $4.85 mf

Curves are presented showing the magnetic properties of known magnetic steel alloys, and the Curie point of several alloys are given. The derivation of formulas and design notes, including the following, are also presented: fundamental of the field form, effective resistance and eddy factor, leakage reactance, transient and subtransient reactances and time constants, vector diagram of a round rotor generator, and synchronous reactance. P.V.E.

N64-11748 Westinghouse Electric Corp., Bloomfield, N.J.
PHYSICAL METALLURGY OF TUNGSTEN AND TUNGSTEN BASE ALLOYS Interim Report, [1 Jun. 1962–30 Apr. 1963]
Heinz G. Sell, George H. Keith, Randolph H. Schnitzel, and N. Francis Cerulli Wright-Patterson AFB, Ohio, Mater. Lab., May 1963 116 p refs
(Contract AF 33(657)-8247)
(WADD-TR-60-37, Pt. IV; AD-252782)

The strength properties of W-TaC, W-Ta_2O_5, W-ThO_2, and W-C (carburized) alloys were investigated at and below 1650° C. Carbides and oxides stabilize the worked (stress relieved) structure to higher temperatures, and strengthening appears to be due primarily to work hardening. Recrystallized, the alloys, in general, are not stronger than pure tungsten. The tensile properties of single and worked single crystals of W-0.25% Ta were studied from room temperature to 1600° C for a variety of conditions. The combined effect of both alloying and grain boundaries on strength was determined to be about 10,000 psi from 300° to 1600° C. Carburizing, heat treating, and quenching has a large effect on the yield stress of W-0.25% Ta single crystal between 300° and 1000° C. The effectiveness of a pack carburizing technique was evaluated by autoradiography.
Author

N64-11758 Southern Research Inst., Birmingham, Ala.
MECHANICAL AND PHYSICAL PROPERTIES OF TZM MOLYBDENUM ALLOY SHEET AND OF TUNGSTEN SHEET Fourth Quarterly Progress Report, 1 Aug.–31 Oct. 1963
J. A. Hamilton and Clifford L. Dotson 15 Nov. 1963 39 p refs
(Contract N600(19)59530)
(Rept. 6495-1479-IV; AD-423413)

The current status of the program is summarized. The preparation of specimens from the tungsten sheet material has continued. The determination of the recrystallization temperatures

of tungsten sheets has been completed; the recrystallization temperature of both the 0.060- and 0.100-in. tungsten sheet was 2400° F. Compression and bend-property evaluations on the tungsten sheet material were conducted. The original plan to evaluate both the TZM and tungsten sheet in the coated condition has been revised to eliminate the evaluation of the coated tungsten sheet, to increase the evaluation of the coated TZM sheet, and to coordinate the work on the coated TZM sheet with an Air Force program on coatings at the University of Dayton Research Institute. I.v.L.

N64-11767 General Dynamics/Ft. Worth, Tex.
EVALUATION OF PROCESS, [FOR] EMBRITTLEMENT RELIEF TREATMENT FOR CRACK-FREE CHROMIUM PLATED SAE 4340 STEEL (260-292 KSI)
W. T. Kaarlela Wright-Patterson AFB, Ohio, Af Materials Lab., 4 Nov. 1963
(Contract AF 33(657)-11214)
(FTDM-3103; AD-423176)

Tests were conducted to ascertain the adequacy of currently used embrittlement relief treatment for crack-free chromium plated SAE 4340 steel. The test specimens used were plated only in the area of the notch to simulate actual production parts plated on only one side. The tests show that 4340 notch tensile specimens, crack-free chromium plated in the area of the notch and then embrittlement relief treated 23 hours at 375° F, will withstand sustained loading of up to 500 hours at 75% of the notched ultimate tensile strength. J.R.C.

N64-11769 Air Force Systems Command, Wright-Patterson AFB, Ohio Air Force Materials Lab.
ON THE EFFECTS OF ANNEALING AND GRAIN SIZE IN POWDER-METALLURGY TUNGSTEN Report, Jun. 1961-Mar. 1963
Friedrich G. Ostermann Sep. 1963 34 p refs
(ASD-TDR-63-676; AD-422980)

Mechanical properties of powder-metallurgy tungsten were studied at low temperatures. Particular emphasis was placed on the effects of annealing temperatures and grain size on the ductile-brittle transition behavior. While room-temperature hardness and grain size were little sensitive to temperature changes within the 1500° to 2300° C range, tensile behavior was markedly influenced. Variation of grain size was achieved by straining and annealing. Grain size effects were evaluated in terms of the Petch-analysis. The k_y- parameter was found to be 4.5×10^7 dynes/cm$^{3/2}$, and an effective surface energy of 11,000 ergs/cm^2 for crack propagation was determined. Fracture was at all times predominantly intergranular. Author

N64-11783 Joint Publications Research Service, Washington, D.C.
PRODUCTION OF COMPACT HAFNIUM BY THE IODIDE METHOD
I. V. Vynarov and Ye. I. Koval'ova 16 Dec. 1963 10 p refs Transl. into ENGLISH of an article from Khim. Prom. (Leningrad), no. 3, Jul.–Sep. 1963 p 46–48
(JPRS-22297; OTS-64-21027) OTS: $0.50

Experiments were conducted under laboratory conditions for the production of compact hafnium by the iodide method in reaction vessels made of molybdenum glass. These vessels facilitate visual observation of the progress of this process. The majority of the experiments were conducted in a 1-liter reaction vessel with a constant charge of 29-g hafnium metal powder and 2.5% of the stoichiometric amount of iodine. The largest yields of the compact metal (up to 82.7%) were obtained at maximum temperatures of 320° C for the reaction vessel and 1300° C for the filament. Also, experiments were conducted in reaction vessels loaded with a mixture containing 50% hafnium metal powder and 50% of hafnium compact metal and hafnium rod ends. The process proceeded rapidly; the ends of the electrode-covering were rapidly covered, and their heating did not exceed normal values. The secondary metal was more plastic and purer than that obtained by the other experiments which employed single iodide regeneration. I.v.L.

N64-11818* Martin-Marietta Corp., Denver, Colo.
DETERMINATION OF LOW-TEMPERATURE FATIGUE PROPERTIES OF ALUMINUM AND TITANIUM ALLOYS, ANNUAL SUMMARY REPORT
F. R. Schwartzberg, R. D. Keys, M. J. Brown, and C. L. Reighter Jul. 1963 130 p refs
(NASA Contract NAS8-2631)
(NASA-CR-55027; NASA CR-63-29) OTS: $10.10 ph, $4.10 mf

Two cryogenic fatigue-testing systems were constructed: one for operation at −320° F, one for −423° F testing. Cryostats were designed to permit fully reversed stressing of sheet materials under axial load conditions. The equipment techniques developed have demonstrated that by careful alignment, fatigue tests of axial-loaded, flat sheet materials can be effectively accomplished using fully reversed stresses. Various aluminum and titanium sheet alloys (0.100-in. nominal thickness) were evaluated in the parent metal and, where applicable, welded conditions. Properties were determined at 70°, −320°, −423° F for fatigue life in the 10^3- to 10^7-cycle range. Titanium alloy 5Al-2.5Sn showed outstanding behavior on the basis of fatigue strength–tensile strength ratio values. Welded Ti-5Al-2.5Sn also exhibited outstanding properties. In the aluminum family, 5456-H343 fared very well. Alloys 2014-T6 and 2219-T87 and welded 5456, 2014, and 2219 all displayed good fatigue resistance. The titanium alloys exhibited a much greater ratio of fatigue–ultimate strength than the aluminum alloys. Author

N64-11823 Aeronautical Research Labs., Melbourne (Australia)
ANALYSIS OF CREEP DATA OF CHROMIUM AND CERTAIN CHROMIUM ALLOYS Metallurgy Report 51
C. S. Landau Jun. 1963 33 p refs
(ARL/MET-51)

The creep data of the chromium alloys E, Z, and X have been collated, and comparisons, statistical where practicable, have been made between the English, American, and Australian results. The creep fracture data from compatible tests were then analyzed by Graham and Walles' method, which was used also to analyze the minimum creep rates and the times to tertiary creep of pure chromium. Author

N64-11826 Joint Publications Research Service, Washington, D.C.
SOME ASPECTS OF SOVIET NON-FERROUS METALLURGY
A. N. Polukarov et al 19 Feb. 1963 30 p refs Transl. into ENGLISH of 2 articles from Tsvetn. Metal. (Moscow), no. 10, Oct. 1962 p 63–68 and 71–75
(JPRS-17727; OTS-63-21172) OTS: $0.75

CONTENTS:

1. IMPROVING THE QUALITY OF INDUSTRIAL-GRADE TELLURIUM A. N. Polukarov p 1–16 refs (See N64-11827 03-18)

2. STRUCTURE AND PROPERTIES OF SAP A. I. Paisov, A. I. Kolpashnikov, and P. Ya-Chen' p 17–27 refs (See N64-11828 03-18)

N64-11827 Joint Publications Research Service, Washington, D.C.
IMPROVING THE QUALITY OF INDUSTRIAL-GRADE TELLURIUM
A. N. Polukarov *In its* Some Aspects of Soviet Non-Ferrous Met. 19 Feb. 1963 p 1–16 refs (See N64-11826 03-18) OTS: $0.75

Methods for improving the sulfate roasting of black tellurium, the alkaline leaching of the sulfated tellurium, and the electrolysis of tellurium are discussed. Also, the smelting of the electrolytic tellurium is discussed. It was found that smelting cleanses tellurium from iron, silicon, antimony, bismuth, and magnesium; partially cleanses tellurium from lead; and entirely fails to cleanse it from copper, nickel, silver, and gold. I.v.L.

N64-11828 Joint Publications Research Service, Washington, D.C.
STRUCTURE AND PROPERTIES OF SAP
A. I. Paisov, A. I. Kolpashnikov, and Pan Ya-chen' *In its* Some Aspects of Soviet Non-Ferrous Met. 19 Feb. 1963 p 17–27 refs (See N64-11826 03-18) OTS: $0.75

Three groups of aluminum powder (SAP) were investigated in the hot-pressed state and also after hot and cold rolling. These groups were: (a) Al + 7.5% Al_2O_3; (b) Al + 10% Al_2O_3; and (c) Al + 8.5% Al_2O_3 + 0,3% Zr. The structure of SAP was investigated under an electron microscope. Results include the following: (1) The SAP sample with a 10% Al_2O_3 content was the only specimen to retain hardness, and consequently stability, at an elevated temperature of 500° C. (2) Cold rolling increased the strength of SAP, at room temperature, because of the work hardening of the aluminum matrix. (3) The strength at room temperature which was introduced by hot rolling is comparatively small. (4) Neither hot or cold rolling of the hot-pressed billet improved the mechanical properties at an elevated temperature of 500° C. Cold rolling substantially reduced the strength of SAP at 500° C. This is perhaps due to the breaking of the coherent connection between the oxidic particles and the aluminum matrix. I.v.L.

N64-11870 Joint Publications Research Service, Washington, D.C.
STRENGTH OF POWDER-METAL MATERIALS AND ALLOYS AT NORMAL AND HIGH TEMPERATURES
G. S. Pisarenko, V. T. Troshchenko et al 12 Dec. 1963 320 p refs Transl. into ENGLISH of a book "Prochnost" Metalloheramicheskikh Materialov i Splavov pri Normal'nykh i Vysokikh Temperaturakh", Kiev, Publishing House of the Acad. of Sci., Ukrain. SSR, 1962 p 1–275
(JPRS-22247; OTS-63-41347) OTS: $5.00

The topics included are: (1) powder-metal materials and the characteristics of their mechanical properties, (2) information on the technology of manufacturing of powder-metal material and construction parts, (3) experimental methods of investigating the strength and plasticity characteristics of powder-metal material, (4) principles of the strength and plasticity characteristics of powder-metal materials, and (5) problems of the theory of the strength of powder-metal materials. R.T.K.

N64-11926 Mc Donnell Aircraft Corp., St. Louis, Mo.
DETERMINATION OF EFFECT OF WHEEL EXPULSION ON AMS 4901 (COMMERCIALLY PURE) TITANIUM Test Results Memorandum
R. Meyer 10 Dec. 1963 9 p
(Contract AF 33(657)-11215)
(A246; AD-425015)

Results of tests to determine the effect of wheel expulsion on AMS 4901 titanium are presented. These results indicated that wheel expulsion from seam welding does not adversely affect the tensile strength of 4901 titanium. The three fatigue specimens tested withstood a maximum stress of 60,000 psi for 500 cycles without failure. P.V.E.

N64-11927 Mc Donnell Aircraft Corp., St. Louis, Mo.
EVALUATION OF THE MECHANICAL PROPERTIES OF AS WELDED AGED INCONEL X Final Report
John V. Minoque 10 Dec. 1963 17 p
(Contract AF 33(657)-11215)
(A249; AD-425057)

Tests were conducted to evaluate the room-temperature properties of 0.050-in.-thick Inconel X repair welded in the aged condition. Material was manual TIG butt welded in both the mill annealed and the aged conditions. The material welded in the annealed condition was then aged. The face of the welds was longitudinally slotted 0.050 wide to a depth one-half the thickness of the weld bead. The slots were filled with weld metal to simulate a weld repair on aged material. Tensile specimens were machined from the weldments; tensile tests were conducted to compare the mechanical properties of the repair welded material to the properties obtained from material aged after welding (to represent an "as welded" condition), and from unwelded, aged material. Results show that repairs effected on welds resulted in substantial strength reduction in the weld heat affected zone. Ductility of the repair welded material was also considerably reduced. Author

N64-11928 McDonnell Aircraft Corp., St. Louis, Mo.
EVALUATION OF INCONEL 718, AGE HARDENABLE NICKEL-CHROMIUM ALLOY Final Report
Gorman Morris 10 Dec. 1963 44 p refs
(Contract AF 33(657)-11215)
(A250; AD-425059)

Tests were conducted to investigate fabrication characteristics of 0.048-in. and 0.250-in.-thick Inconel 718. Evaluations were made in the following areas: formability (brake forming, uniform elongation in eight inches, and Guerin and impact rubber forming, and dimple forming); resistance welding, fusion butt welding, and TIG spot welding. Room-temperature tensile tests revealed that the mechanical properties were typical for the alloy. Total elongation and uniform elongation tests indicated good formability characteristics of the alloy in the annealed condition. A minimum bend radius of 0.031 in. was attained when specimens were bent perpendicular to the rolling direction; a 0.047-in. minimum bend radius was obtained when specimens were bent parallel to the rolling direction. Guerin rubber forming and impact rubber forming methods were used to form 0.048-in. specimens on a stretch flange radius of 6.05 in. and a shrink flange radius of 9.95 in. The specimens were formed around a 0.090-in. bend radius. Both forming methods resulted in formed parts with near production tolerances. Testing on all aged test specimens was ceased at the conclusion of the postweld aging cycle. Author

N64-11955 Atomics International, Canoga Park, Calif.
DEVELOPMENT OF FERRITIC STEELS FOR HIGH TEMPERATURE SODIUM SERVICE (PART II)
W. J. Anderson, G. S. Sheffield, and A. J. Birkle 30 Nov. 1963 65 p refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-7544)

The suitability of modified 2.25 Cr–1 Mo alloy steels for sodium service was investigated. Eleven modifications were examined to establish heat treatment behavior, mechanical properties, resistance to decarburization in liquid sodium, and weldability. Two of the alloys, 4S8 (2.25 Cr–1 Mo–0.6 V–0.1 Cb) and 4S4 (2.25 Cr–1 Mo–0.6 V), were found to have the best combination of properties. When heat treated by normalizing and tempering, their mechanical properties to 1200° F were found to be comparable to those of Type 304 stainless steel. A low-chromium nickel-base alloy was developed for welding the steels, to give either fully heat treatable joints or to apply the butter-weld technique useful in field welding. It provides high joint efficiency without sacrifice in joint ductility. Author

N64-11984 General Electric Co., Cincinnati, Ohio
STRESS-RUPTURE AND CREEP PROPERTIES OF REFRACTORY METALS TO 2800° C
J. B. Conway, D. G. Salyards, W. L. Mc Cullough, and P. N. Flagella [1963] 23 p Presented at ANS Meeting, Cincinnati, Ohio, 17–19 Apr. 1963
(TM-63-4-12)

The stress-rupture and creep properties of several refractory metals and refractory metal alloys were determined at temperatures above 0.5 times the melting temperatures. Data for molybdenum, molybdenum-50 w/o rhenium, tantalum, tantalum-10 w/o tungsten, tungsten-25 w/o rhenium, and rhenium were accumulated to a maximum of 2800° C for the higher melting point materials. Tests of the effect of hydrogen and argon on high temperature properties of these materials were also made. The results of the tests are included and are presented in tabular and graphic form. R.T.K.

N64-12003 National Bureau of Standards, Washington, D.C.
TENSILE AND IMPACT PROPERTIES OF SELECTED MATERIALS FROM 20 TO 300° K
K. A. Warren and R. P. Reed 28 Jun. 1963 57 p refs
(NBS-Monograph-63) GPO: $0.35

The tensile and impact properties of structural materials were experimentally determined at temperatures from 20° to 300° K. Tensile properties of a few materials were also determined at 4° K. The materials included 42 commercial alloys of iron, aluminum, titanium, copper, nickel, and cobalt, and 2 metal-bonded carbides. The properties experimentally determined were the yield strength, tensile strength, elongation, and reduction of area, the stress versus strain curve, and the impact energy. The test equipment and procedures are described. The individual data are presented in tables, and the average results are displayed in graphs. Author

N64-12012 Joint Publications Research Service, Washington, D.C.
THE STRENGTH AND SUPER STRENGTH OF METALS
M. Kh. Rabinovich 24 Dec. 1963 177 p Transl. into ENGLISH of a monograph "Prochnost' i Sverkhprochnost' Metalov", Moscow, Acad. of Sci. USSR, 1963 198 p
(JPRS-22445; OTS-64-21114) OTS: $3.00

The basic physical phenomena associated with the nature of the strength of metals are considered, with emphasis on the underlying causes, and their effect on the metal properties is evaluated. This approach to the material makes it interesting and useful to a wide range of readers. Author

N64-12013 Lockheed Missiles and Space Co., Sunnyvale, Calif.
ABNORMAL GRAIN GROWTH IN ALUMINUM AND ITS ALLOYS: AN ANNOTATED BIBLIOGRAPHY
Charles G. Gros, comp. Jun. 1963 16 p 37 refs
(SRB-63-3)

This work deals with abnormal grain growth in aluminum and its alloys in the field of critical straining and thermal treatment. Material on the prevention of such growth by "seeding" aluminum alloys with intermetallics in included, as is material on other new prevention techniques. The period covered is from 1950 through May 1963. Author

N64-12030 Lockheed-Georgia Co., Marietta
EFFECT OF NUCLEAR RADIATION ON MATERIALS AT CRYOGENIC TEMPERATURES Quarterly Progress Report No. 11, Jul.–Sep. 1963
C. A. Schwanbeck [1963] 31 p refs
(NASA Contract NASw-114)
(NASA CR-55044; ER-6590) OTS: $3.60 ph, $1.13 mf

Progress included: continued preparation for the in-pile screening program, with calibration of thermocouples on instrumented test specimens against a National Bureau of Standards calibrated platinum resistance thermometer; modification of the test loop carriage assemblies; and checkout of the test loop transfer cask and cart. Flux measurements were made at various power levels in HB-2 and the results are shown in detail. Author

N64-12039 General Electric Co., Cincinnati, Ohio Flight Propulsion Div.
MATERIALS PROPERTY DATA COMPILATION. PART I: CAST UDIMET 500 AND WROUGHT UDIMET 500 Seventh Quarterly Report
R. J. Favor and H. G. Popp 1 Nov. 1963 250 p refs
(Contract AF 33(657)-8017)
(AD-422498)

Compilation of reports containing mechanical properties on Udimet 500 is included. Mechanical properties reported are tensile, rupture, creep, fatigue and miscellaneous other properties. Author

N64-12045 Battelle Memorial Inst., Columbus, Ohio Defense Metals Information Center
CREEP OF COLUMBIUM ALLOYS
24 Jun. 1963 94 p refs
(Contract AF 33(616)-7747)
(DMIC Memo 170; AD-424097)

An attempt was made to compile and review existing creep data for columbium alloys to gain insight into their merits and limitations for time dependent structural services. The effort included general physical and metallurgical effects, creep testing of columbium alloys, the presentation of creep data, recommended procedures for creep testing, and creep testing data for columbium and its alloys. C.L.W.

N64-12046 Battelle Memorial Inst., Columbus, Ohio Defense Metals Information Center
DESIGNATIONS OF ALLOYS FOR AIRCRAFT AND MISSILES
R. M. Evans 4 Sep. 1963 57 p
(Contract 33(616)-7747)
(DMIC-MEMO-177; AD-424998)

Tabulations of trade names, aeronautical and military specifications, and producers of stainless steels, high-alloy steels, and superalloys are presented in three tables. In table one, a numerical and alphabetical listing of metals and alloys by trade designations is presented. Where information was available, chemical compositions and references to other designations are included. Table two is a tabulation of Aeronautical Materia

Specifications (AMS) including American Iron and Steel Institute standards (AISI), Society of Automotive Engineers (SAE), and trade designations. Table three presents AISI designations for hot-work tool steel; also, some tool steels conforming to other AISI designations are included. P.V.E.

N64-12062 Materials Research Lab., Inc., Richton Park, Ill.
THE USE OF STRAIN SOFTENING TO IMPROVE THE PROPERTIES OF REFRACTORY METALS Final Report
E. J. Ripling and S. Mostovoy 1963 43 p refs
(Contract NOw-62-0725-c)
(AD-425148) OTS: $4.60

A roller flexer that makes it possible to cyclically strain sheets with a minimum amount of bowing in the work rolls has been built. Using this device, the transition temperature of molybdenum base alloys was lowered 60° to 100° F. Finding the optimum conditions for effecting the maximum ductility improvement in these materials will require a considerable amount of additional study. A single attempt to improve the properties of tungsten by flexing has not been successful. Author

N64-12072 Battelle Memorial Inst., Columbus, Ohio Defense Metals Information Center
THE CURRENT STATUS OF THE WELDING OF MARAGING STEELS
R. M. Evans and R. R. Monroe 16 Oct. 1963 31 p refs
(Contract AF 33(616)-7747)
(DMIC-Memo-182; AD-419383)

Among the various types of maraging steel, the greatest development and evaluation effort has been expended on the 18-percent nickel variety. This type combines higher strengths and simpler heat treatments with greater toughness than the other types of maraging steel. Carefully designed heat-treatment schedules and cold working of welds in the 25-percent maraging steel have produced strengths equal to that of the base metal, but, the ductility was low. Utilization of the 20-percent nickel alloy suffers from the same difficulties. There is little question that welds with satisfactory strength can be made in 18-percent nickel maraging steels in a wide thickness range. With proper choice of filler-metal composition, welding speed, cleaning procedure, shielding, and other welding variables, porosity-free and crack-free welds are obtained by most commercial welding processes. The fracture toughness of welds in the maraging steels is a subject of considerable concern among users. There appears to be agreement that the fracture toughness of welds in these steels is considerably lower than that of the unaffected parent metal. Author

N64-12077 Cornell U., Ithaca, N.Y.
ENVIRONMENT AND FRACTURE OF HIGH STRENGTH STEEL
H. H. Johnson and A. M. Willner 20 Oct. 1963 54 p refs
(Contract Nonr-3286(00)(X))
(NRL-TM-240; AD-425981)

The role of water and water vapor in promoting stable crack extension and delayed failure in high strength steel was investigated within the framework of fracture mechanics. The resistance method was utilized to steady the initiation and growth of cracks in center-notched precracked sheet specimens of H-11 steel at the 230,000 psi strength level. The stress field parameter K_I at crack initiation was controlled by the environment; the crack extension rate was controlled by the environment and the instantaneous value of the stress field parameter K. Stable crack extension was absent in a purified argon environment; with relative humidities less than approximately sixty percent, the crack extension rate was insensitive to temperature, but increased with relative humidity and stress field parameter. With higher relative humidities or in the presence of water, the crack growth rate again increased with K, but also varied with temperature as a thermally activated process, with an apparent activation energy of approximately 9,000 cal/mole. Author

N64-12094 Nuclear Metals, Inc., Concord, Mass.
BERYLLIUM CORROSION Final Technical Report, 25 Apr. 1962-24 Apr. 1963
D. S. Kneppel Washington, AEC Div. of Tech. Inform., 24 Mar. 1963 95 p refs Prepared under the U.S.-EURATOM Joint Res. and Develop. Program
(Contract AT(30-1)-3012)
(MNI-1911; EURAEC-804) OTS: $2.00

An investigation of the corrosion behavior of beryllium showed that commercial-purity beryllium will survive in 343° C water without significant attack for prolonged periods. The presence of minute amounts of copper in the water has a deleterious effect on corrosion resistance. High-purity beryllium exhibits poor corrosion resistance in high-temperature water. However, the material can be improved by alloying. Heat-treated alloys containing 0.4w/o Ni, 0.2w/o Ni plus 0.2w/o Fe, or 0.5w/o Ni plus 0.5w/o Fe showed good corrosion resistance in 343° C water. Individual alloy additions to high-purity beryllium of Al, Mg, Mn, Si, Fe, Ni, or Cr in amounts comparable to their content in commericial-purity beryllium had no effect in improving the corrosion resistance. Author

N64-12104* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
RESIDUAL STATIC STRENGTH OF SEVERAL TITANIUM AND STAINLESS-STEEL ALLOYS AND ONE SUPERALLOY AT −109° F, 70° F, AND 550° F
I. E. Figge Washington, NASA, Dec. 1963 23 p refs
(NASA TN D-2045) OTS: $0.75

Residual static-strength tests were conducted on 8-in.-wide sheet specimens containing central fatigue cracks of various lengths at −109° F, 70° F, and 550° F. The materials investigated were: Ti-4Al-3Mo-IV (aged), Ti-6Al-4V (annealed), Ti-8Al-1Mo-1V (triplex annealed), AM 350 (20% CRT), AM 350 (double aged), PH 15-7Mo (TH 1050), AISI 301 (50% CR), and René 41 (condition B). When compared on a residual strength–density basis, the titanium alloys, in general, and the alloy Ti-8A1-1Mo-1V (triplex annealed), in particular, appear to demonstrate the most favorable residual static-strength properties of the materials tested. Analysis of the data by the use of the unified notch-strength analysis method is discussed. Author

N64-12126 IIT Research Inst., Chicago, Ill. Technology Center
DISPERSION-STRENGTHENED VANADIUM ALLOYS Bimonthly Report No. 5, 14 Aug. 1963-13 Oct. 1963
F. C. Holtz 8 Nov. 1963 18 p refs
(Contract N600(19)-59567)
(IITRI-B6007-5; AD-423428)

Vanadium-columbium alloys, dispersion-strengthened by additions of titanium, zirconium, or hafnium in combination with carbon, have been prepared by arc-melting. Compositions containing 1w/o hafnium with small carbon additions are more difficult to fabricate and have higher recrystallization temperatures than similar alloys containing zirconium and carbon. Short-time creep tests were conducted in 2000° F air on siliconized V-60w/o Cb base specimens. At stress levels of 8500 to 8850 psi, creep values of 0.5 to 1.2 percent were measured in 2 1/2 hours. Some of the specimens retained their room-temperature tensile strength and ductility after stressing at 2000° F. These

initial data indicate that V-60w/o Cb alloys containing 1w/o titanium with residual melting stock impurities are more creep resistant at 2000° F than the alloys containing 1w/o zirconium with 0.1 or 0.2w/o carbon. Author

N64-12151 Joint Publications Research Service, Washington, D.C.
EFFECT OF OXYGEN ON THE PROPERTIES AND HEAT TREATMENT OF TITANIUM ALLOY VT14
A. I. Khorev et al 3 Jan. 1963 11 p Transl. into ENGLISH of an article from Tsvetn. Metal. (Moscow), no. 11, Nov. 1963 p 69–74
(JPRS-22595; OTS-64-21203) OTS: $0.50

The influence of oxygen on the heat treatment and on the mechanical and technological properties of the two-phase thermally strengthened titanium alloy VT-14 (4% Al, 3% Mo, 1% V, and the rest Ti), containing 0.05%, 0.10%, 0.15%, 0.20%, and 0.30% oxygen according to the charge, was investigated. Results include the following: (1) A definite combination of strength and plasticity, achieved by the usual heat treatment with respect to the pure metal containing 0.05% O_2 can be obtained for the alloy with an increased oxygen content when a "milder" system of strengthening heat treatment is used. Consequently, alloys with a large O_2 content should be quenched from a lower temperature and aged at a higher temperature. (2) A 0.25% increase in the oxygen content in the annealed alloys leads to a 15 to 20 kg/mm^2 increase in the strength and is accompanied by a reduction of the relative lengthening, especially at an O_2 content above 0.15%. (3) The difference between the strength and yield point is ~20 kg/mm^2 for alloys quenched from 800° and 850° C. (4) An increase in the O_2 content from 0.05% to 0.3% leads to a threefold reduction of the angle of flexure. Moreover, the technological plasticity is reduced sharply at an O_2 content of 0.15%. I.v.L.

N64-12164* Douglas Aircraft Co., Santa Monica, Calif.
EVALUATION OF MARAGING STEEL FOR APPLICATION TO SPACE LAUNCH VEHICLES Progress Report No. 2
W. V. Mixon [1963] 35 p refs
(NASA Contract NAS7-214)
(NASA CR-52412; SM-43105; WOO-PR-63-172) OTS: $3.60 ph, $1.25 mf

The second heat of 18Ni-7Co-5Mo maraging steel to be evaluated has been received and testing has been started. Preliminary tests indicate the steel, which is higher in titanium content, may be exceptionally high in strength for the 250-KSI-grade alloy. Indications are that fracture toughness may be lower for this heat than for the two previously reported heats. Author

N64-12182 Lockheed Missiles and Space Co., Sunnyvale, Calif.
RECOVERY BEHAVIOR OF COLD-WORKED METALS [Final Report, 1 Jun. 1961-31 Aug. 1963]
J. L. Lytton, T. E. Tietz, and C. L. Meyers Wright-Patterson AFB, Ohio. Directorate of Mater. and Processes May 1963 75 p refs
(Contract AF 33(616)-8346)
(ASD-TDR-62-984; AD-408779) OTS: $2.00

Recovery of tensile flow stress of four binary aluminum alloys and of the high-purity base aluminum was studied under no-load conditions at temperatures of 80°, 120°, 160°, and 200° C, and under conditions of creep strain at 160° C, for recovery times up to 1,000 hr. At the three higher recovery temperatures, 120°, 160°, and 200° C, and for the longer recovery times, the alloys Al-Mg, Al-Zn, and Al-Cu all experienced a greater degree of recovery than the high-purity base aluminum. Of these three alloys, the Al-Cu alloy clearly exhibited the greatest degree of recovery. The Al-Ag alloy was excluded from the comparison because of an apparent strengthening process which occurred during recovery. All the alloys showed a strong increase in flow-stress recovery during creep strain over that experienced during no-load recovery; however, the relative order of recovery for the different alloys did not change. Author

N64-12205 Army Missile Command, Huntsville, Ala. Redstone Scientific Information Center
FREQUENCY DISTRIBUTION IN BI-METALLIC ALLOYS (I)
T. Takaki and T. Oguchi 9 Oct. 1963 12 p refs Transl. into ENGLISH by Joint Publ. Res. Service, of an article from Buseiron Kenkyu, (Osaka), v. 34, 1951 p 44–51
(RSIC-82; AD-423928)

Expressions are derived for the lattice moment of frequency and frequency distribution. J.E.T.

N64-12212 IIT Research Inst., Chicago, Ill.
STUDY OF COMPREHENSIVE FAILURE THEORY
M. E. Goldberg, A. Horberg, H. A. Lauffenburger, D. W. Levinson, and R. G. Stewart Griffiss AFB, N.Y., Appl. Res. Lab., Nov. 1963 42 p refs
(Contract AF 30(602)-3054)
(RADC-TDR-63-449; IITRI-E6006-4; AD-424966)

Study of metal resistors continued, in order to determine the operative physical mechanisms causing resistance to change with time and temperature. Microprobe analyses indicate that the deposited metal film is richer in aluminum, chromium, and copper than the basic alloy from which the film is formed. Oxidation kinetics are studied by depositing a film of the resistive material onto the surface of a quartz crystal and observing the change in frequency with time and temperature. Such a frequency shift will be related to a change in mass due to oxidation of the film. These crystal experiments have indicated aggregation as a possible failure mechanism; studies were initiated to establish its true significance. Author

N64-12245 Climax Molybdenum Co. of Michigan, Detroit
DEVELOPMENT AND EVALUATION OF TUNGSTEN-BASE ALLOYS Final Report, 15 Mar. 1962-15 May 1963
M. Semchyshen, Robert Q. Barr, and Gordon D. Mc Ardle 15 Nov. 1963 78 p refs
(Contract NOw 62-0419-c)
(AD-424267)

Tungsten-base alloys of the following nominal compositions were prepared by the vacuum-arc-casting process: W + 1% Cb, W + 3% Mo + 1% Cb, W + 0.1% Hf, W + 3% Mo + 0.1% Hf, W + 0.05% Zr, and W + 3% Mo + 0.05% Zr. Charges blended to obtain each of the aim compositions contained small additions of carbon to effect deoxidation during arc melting. One heat of the W + 0.05% Zr composition was deoxidized with boron. Tensile and creep-rupture strengths of all of the alloys were found to be significantly higher than those observed for unalloyed tungsten of comparable carbon content. On the other hand, the variation in strength and, to an even greater extent, workability from alloy to alloy was noticeably sensitive to residual carbon and boron contents. Tensile transition temperatures were found to be markedly influenced by the degree of deoxidation achieved during arc melting. The more thoroughly deoxidized alloys exhibited tensile transition temperatures slightly higher than that of well-deoxidized, unalloyed tungsten. Author

N64-12249 Battelle Memorial Inst., Columbus, Ohio Defense Metals Information Center
THE CURRENT STATUS AND 1970 POTENTIAL OF SELECTED DEFENSE METALS
Webster Hodge et al 31 Oct. 1963 47 p refs
(Contract AF 33(616)-7747)
(DMIC Memo. 183; AD-425604)

The current status and the 1970 potential of the following are presented: (1) beryllium and its alloys; (2) cobalt and its alloys; (3) niobium and its alloys; (4) high-strength steels; (5) molybdenum and its alloys; (6) nickel and its alloys; (7) stainless steels; (8) tantalum and its alloys; (9) titanium and its alloys; and (10) tungsten and its alloys. Also, current coatings for refractory metals and the 1970 potential of these coatings are discussed. I.v.L.

N64-12260 Naval Research Lab., Washington, D.C.
NEUTRON EMBRITTLEMENT OF REACTOR PRESSURE VESSEL STEELS
L. E. Steele and J. R. Hawthorne 22 Oct. 1963 39 p refs
(NRL-5984; AD-423526) OTS: $1.00

The demonstrated criterion of nil ductility transition (NDT) temperature provides the basis for meaningful analysis of neutron-induced embrittlement in reactor steels. Results to date indicate that the degree of embrittlement depends upon the material, the neutron exposure, and the temperature during irradiation. These same variables also affect the degree of notch ductility recovery effected by postirradiation heat treatment. In addition, the time and temperature of heat treatment have been shown to play an important role in establishing the recovery pattern. Author

N64-12265 Army Missile Command, Huntsville, Ala.
POLAROGRAPHIC METHOD OF IRON DETERMINATION IN ORES AND SLAGS IN THE METALLURGIC INDUSTRY
Yu. S. Lyalikov 1 Jun. 1963 15 p refs Transl. into ENGLISH of an article from Zavodsk. Lab. (Moscow), 1938 p 395–399
(RSIC-15; AD-405860)

A polarographic method of iron determination in ores and slags is described. This method involves the use of the height of the wave of the iron. The calibration curve is used in determining the concentration of the iron from the height of the wave. In this manner, a polarographic determination was made of iron tartrate and iron citrate complexes, in an ammoniacal medium, in slags (blast-furnace and martensite) and ores. The duration of iron determinations was reduced from the previous length of time to 10 to 15 minutes. I.v.L.

N64-12299 Army Missile Command, Huntsville, Ala. Redstone Scientific Information Center
CONCERNING THE STRENGTH AND STABILITY OF CYLINDRICAL BIMETALLIC SHELLS
E. I. Grigolyuck (Acad. Sci. USSR) 16 Apr. 1963 51 p refs Transl. into ENGLISH from Inzhenernyi Sbornik, v. 16, 1953 p 119–148
(RSIC-12; AD-404813) OTS: $5.60

The strength and stability of an axially symmetric, cylindrical, bimetallic shell is studied. The shell is assumed to be thin and elastic. It is considered that the hypothesis of incompressibility of the layers and of the nondeformability of the normal element retain this force also for the bimetallic shell. Separately investigated was a shell of an infinite and finite length, as well as so-called condition of reduction when applicable to the shell. Examples of calculation of shells down to the determinants of displacements and stresses are given. Author

N64-12305 Technion Research and Development Foundation Ltd., Haifa (Israel)
RESEARCH ON THE DEPENDENCE OF THE STRENGTH OF METALS ON THE RATE OF STRAIN Technical Report
Markus Reiner and David Abir 15 Mar. 1963 73 p refs
(Contract AF 61(052)-304)
(ARL-63-1527; AD-419128)

The thermodynamic theory of strength of a standard linear solid is specialized to the case of simple tension. Tensile experiments are carried out with four different kinds of mild steel at three different rates of loading. It is found that the coefficient of viscous damping decreases with increasing rate of loading. Both the yield stress and the yield strain increase with increasing rate of loading. Author

N64-12309 Battelle Memorial Inst., Columbus, Ohio
THE PROBLEM OF HYDROGEN IN STEEL
A. R. Elsea and E. E. Fletcher 1 Oct. 1963 38 p refs
(Contract AF 33(616)-7747)
(DMIC-Memo.-180; AD-425124) OTS: $1.00

This memorandum is an introduction to the problem of delayed, brittle failures associated with hydrogen in steel, particularly high-strength steel. The effects of hydrogen on the mechanical properties of steel are dealt with, and the behavior of material susceptible to delayed, brittle failure is described. Also, the effects of such factors as strength level, magnitude of applied stress, hydrogen content, steel composition, test temperature, and strain rate on hydrogen embrittlement and the susceptibility to hydrogen-induced, delayed, brittle failure are discussed. Possible sources of hydrogen in steel and the types of tests useful in determining the susceptibility to delayed failure are outlined. Author

N64-12310 Battelle Memorial Inst., Columbus, Ohio Defense Metals Information Center
REPORT ON THE THIRD MARAGING STEEL PROJECT REVIEW
A. M. Hall et al 7 Oct. 1963 59 p refs
(Contract AF 33(616)-7747)
(DMIC Memo. 181; AD-425125) OTS: $1.50

It is to be noted that attention is being directed primarily to the 18-percent-nickel type of maraging steel in preference to the 20-percent-nickel and 25-percent-nickel types. The 18-percent-nickel maraging steel is hardened by means of a much simpler heat-treating schedule and is considered to be superior in fracture toughness. Among the grades of 18-percent-nickel maraging steel, major emphasis is being placed on those which develop yield strengths in the range of 200,000 to 250,000 psi on being heat treated according to the usual procedure (annealed at 1500° F and aged 3 to 6 hours at 900° F). This is especially the case when material in plate thicknesses is under consideration. For sheet, the interest also extends to steels capable of developing 280,000- to 300,000-psi yield strength. An effort is underway to determine the capability of the 18-percent-nickel type of steel, or modifications thereof, to meet hull plate requirements for deep-submergence submarines. Here, the interest covers steels with yield strengths ranging down to some 140,000 psi. Author

N64-12316 Armour Research Foundation, Chicago, Ill.
DEVELOPMENT AND APPLICATION OF A THEORY FOR PLASTIC DEFORMATION OF CEMENTED ALLOYS. ROCKET NOZZLE MATERIALS Quarterly Report, 1 Oct.-31 Dec. 1962
N. M. Parikh 30 Jan. 1963 17 p refs
(Contract DA-11-022-505-ORD-3092)
(WAL-TR-372/32-7-T3; AD-416347)

The influence of process parameters on room-temperature and high-temperature mechanical behavior of W-Ag and Mo-Ag composites was investigated. The process parameters were sintering conditions, particle size, nickel content, and infiltration time. All the work was done with tungsten and molybdenum powders only. Nominal compositions were W-20%(Ag-1%Li) and Mo-20% (Ag-1%Li). Attempts were made to develop a one-step process for fabricating sound composite alloys. Author

N64-12341 Armour Research Foundation, Chicago, Ill. Illinois Inst. of Tech.
DEVELOPMENT AND APPLICATION OF A THEORY FOR PLASTIC DEFORMATION OF CEMENTED ALLOYS. ZONE REFINING OF CEMENTED TUNGSTEN-BASE ALLOYS Quarterly Report, 1 Jan.–31 Mar. 1963
N. M. Parikh Watertown, Mass., Watertown Arsenal, 16 May 1963 14 p
(Contract DA-11-022-505-ORD-3092)
(WAL TR-372/32-8-T1)

Current work shows that the processing conditions employed in sintering and rolling W-Ni-Fe alloys, zone refining and hot rolling the sheet bars, result in pure tungsten sheets which have mechanical properties comparable to those of commercial sheets. The sheet bars were zone refined at temperatures from 3800° to 4400° F and hot–cold rolled down to sheets 0.064 in. thick. Properties of the sheets measured were transition temperature and high-temperature tensile properties. Author

N64-12343 General Dynamics, Fort Worth, Tex.
COMPILATION OF UNPUBLISHED MATERIALS INFORMATION. Phase II Progress Report, 6 May–15 Nov. 1963
C. E. King 15 Nov. 1963 63 p refs
(Contract AF 33(657)-11214)
(FPR-010; AD-424191)

A short report for each item of current materials or processing research and development in progress at General Dynamics, Fort Worth, is presented. The materials and processes deal, in general, with metals, alloys, ceramics, adhesives, lubricants, resins, and coatings. A brief description of each research and development program is given, including the general test plan and methods to be used in reaching the desired objectives. Results and conclusions are presented, when available. I.v.L.

N64-12358 Joint Publications Research Service, Washington, D.C.
INVESTIGATION OF THE TERNARY SYSTEMS NIOBIUM-TUNGSTEN-ZIRCONIUM AND NIOBIUM-MOLYBDENUM-ZIRCONIUM
Ye. M. Savitskiy and A. M. Zakharov 3 Jan. 1964 14 p refs Transl. into ENGLISH of an article from Issled. Splavov Tsvetn. Metal., Akad. Nauk SSSR., Inst. Met. (Moscow), no. 4, 1963 p 108–116
(JPRS-22593; OTS-64-21201) OTS: $0.50

Polythermal sections of the ternary systems Nb-W-Zr and Nb-Mo-Zr (with ratios W:Zr = 4:1, 1:1, 1:3 and Mo:Zr = 2.1:1, 1:1, 1:3) were studied by the methods of microscopic investigation, the determination of the melting point and the microhardness, and X-ray diffraction. Projections of the polythermal diagrams onto the plane of the concentration triangle as well as isothermal section, at the temperatures 2000°, 1800°, and 100° C, were constructed. It was shown that the ternary systems Nb-W-Zr and Nb-Mo-Zr possess similar structures within the investigated temperature range. Also, it was established that the mutual solubility of W with Zr and Mo with Zr in Nb, in the solid state, is limited and is greatly reduced when the temperature is lowered. I.v.L.

N64-12362 Solar, San Diego, Calif.
EVALUATION OF COATED REFRACTORY METAL FOILS Quarterly Progress Report No. 5, 1 Jul. 1963–30 Sep. 1963
V. S. Moore and A. R. Stetson 13 Oct. 1963 97 p refs
(Contract AF 33(657)-9443)
(RDR 1325-5; AD-423672)

A multiple balance statistical approach was selected for evaluation of the four coating systems on the four foil gage columbium alloys included in the program. Using this technique, variables such as flow, stress, pressure, edge preparation, and batches are superimposed on specimens to allow interaction of variables to be observed. A description is given of the design and operation of a multienvironmental test chamber for use in performing the multiple balance experiments. Additional diffusion studies were initiated on the four modifications of the Cr-Ti-Si TAPCO coating to investigate diffusion species producing loss in ductility. An industrial and literature survey of the quality control techniques currently used to inspect coated refractory metal alloys is presented. Preliminary experimental results on radiography, optical, fluorescent penetrant, and infrared inspection methods are included. The problem of coating repair after damage has been investigated, and general boundaries and criteria established for an experimental repair program. Work was initiated on the study of the compatibility of coated refractory metal systems in contact with each other, and with other materials. Author

N64-12363 Southern Research Inst., Birmingham, Ala.
DEVELOPMENT OF HIGH STRENGTH AND FRACTURE TOUGHNESS IN STEELS THROUGH STRAIN-INDUCED TRANSFORMATIONS Second Quarterly Progress Report, 1 Oct.–31 Dec. 1962
J. D. Morrison, M. A. Campbell, and J. R. Kattus 3 Jan. 1963 11 p refs
(Contract DA-01-009-ORD-1070)
(WAL-TR-323.4/2-1; AD-401439)

A study is being made to determine the effects of variations in alloy content, cold-working temperature, and amount of cold work on the tensile and toughness properties of stainless steels, generally of the Type 301 compositon. The aim of this program is to arrive at an alloy composition and processing procedure that will produce an optimum combination of strength and toughness. The experimental materials have been produced, machined into rolling blanks, and hot rolled at 2000° F to a wrought structure. Cold-rolling operations are now in progress. Author

N64-12375 General Dynamics/Fort Worth, Tex.
18 NiCoMo (300) MARAGING STEEL FORGINGS
F. C. Nordquist 8 Nov. 1962 37 p Presented at Aeronautical System Div. Maraging Steel Project Review, Biltmore Hotel, Dayton, Ohio, 7–8 Nov. 1962
(Contract AF 33(657)-11214)
(FZM-2731; AD-423717)

The purpose of this investigation is to determine if the 18 Ni-Co-Mo (300) maraging steel would be a satisfactory material for use in forged, high-strength aircraft components. The evaluation consists of conducting tensile, notched tensile, fatigue, stress corrosion, and fracture toughness tests on forged material. Results of testing, to date, are: (1) The forged material is anisotropic. This shows up in the reduction of area, notched tensile, fatigue and stress corrosion testing. (2) The endurance limits for thick forged sections in axial tension-tension fatigue at R = 0.1 are: smooth, longitudinal, 115,000

psi; smooth, short transverse, 95,000 psi; notched $K_t = 2$, longitudinal, 65,000 psi; and notched $K_t = 2$, short transverse, 60,000 psi. (3) Forged material is susceptible to stress corrosion cracking in both salt water and distilled water environments. (4) Materials forged at 2300° F have reduced ductility and show some loss in fatigue strength in the longitudinal direction. The resistance to stress corrosion cracking is not effected. (5) Forging billet stock cannot be used as stock for large machined parts. I.v.L.

N64-12377 Climax Molybdenum Co. of Michigan, Detroit
STUDIES OF REFRACTORY ALLOY SHEET MATERIALS Quarterly Report, 15 Jun. 1963-15 Sep. 1963
Robert Q. Barr, Paul R. Pfefferle, and M. Semchyshen [1963] 13 p
(Contract NOw 62-0419-c)
(AD-422106)

The following alloys have been consolidated by the vacuum-arc-casting technique, and converted to 0.05-in.-thick sheet: (1) Mo + 1.59% Cb + 0.52% Ti + 0.21% Zr + 0.068% C, (2) Mo + 1.30% Ti + 0.35% Zr + 0.093% C, (3) W + 3.10% Mo + 0.04% Zr + 0.001% C. The two molybdenum-base alloys were either recrystallized, solution treated, or solution treated and aged prior to rolling. The tungsten-base alloy was in the recrystallized condition prior to rolling to final size. Author

N64-12381 Armour Research Foundation, Chicago, Ill.
DEVELOPMENT AND APPLICATION OF A THEORY FOR PLASTIC DEFORMATION OF CEMENTED ALLOYS. TASK I: ZONE REFINING OF CEMENTED TUNGSTEN-BASE ALLOYS Quarterly Report, 1 Oct.-31 Dec. 1962
N. M. Parikh 30 Jan. 1963 12 p refs
(Contract DA-11-022-505-ORD-3092)
(WAL TR 372/32-7-T1; AD-416377)

Several bars of 96 W-4(7Ni-3Fe) alloy were sintered, rolled, and zone refined. Zone refining was accomplished at 3812° F, and the resultant bars had very low residual matrix content. The zone-refined bars were then hot rolled at 2966° F and hot-cold rolled down to 1922° F. Some of the mechanical properties of these bars have been determined and are compared with those of the commercial materials. Author

N64-12389 General Electric Co., Cincinnati, Ohio Nuclear Materials and Propulsion Operation
HIGH-TEMPERATURE MATERIALS PROGRAM Progress Report No. 29, Part A [15 Aug.-15 Oct. 1963]
30 Nov. 1963 82 p refs
(Contract AT(40-1)-2847)
(GEMP-29A) OTS: $2.00

High-temperature reactor-materials fabrication research was conducted, and the effect of radiation on high-temperature alloys was studied. Included in the fabrication research were stress-rupture and creep tests of arc melted molybdenum TZM, rupture strength testing of W-25Re (a/o), tungsten-Rhenium; and the correlation of the stress-rupture time and minimum creep rate data for tungsten, molybdenum, tantalum, and some of their alloys. In the radiation-effects study, creep rupture testing was conducted on irradiated tungsten; alloys containing boron additions were tested; and computer calculations were made on the initial damage state produced in finite, neutron-irradiated iron specimens. C.L.W.

19 MATERIALS, NONMETALLIC

Includes mechanical and physical properties of nonmetals (e.g., plastics). *For related information see*: 07 Chemistry; 17 Machine Elements and Processes; 18 Materials, Metallic; 33 Stresses and Loads; and 34 Structural Design.

N64-11541 Rock Island Arsenal, Ill.
THE DEVELOPMENT OF FIBERBOARD TARGETS FOR THE M31A1 TRAINFIRE MECHANISM
A. C. Saunders, L. W. Lynch, and W. F. Garland 5 Sep. 1963 51 p
(RIA-TR-63-2879; AD-422704)

Fiberboard targets can be made which will adequately fill the field service requirements. One such material was composed of a large percentage of long virgin sulfate fibers in combination with a smaller amount of jute fibers, and having a high resin wet-strength treatment. The laminating adhesive was highly water resistant, and the board was coated on both surfaces with a water-repellent plastic. Properties, important in the determination of firing effectiveness, were found to be thickness, density, water absorption, and modulus of elasticity. Author

N64-11544 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Tech. Div.
THEORETICAL BASIS OF THE SYNTHESIS OF "SITALL" FROM SLAG
I. I. Kitaygorodskiy 22 Aug. 1963 18 p refs Transl. into ENGLISH from Zh. Vses. Khim. Obshch., v. 8, no. 2, 1963 p 192-197
(FTD-TT-63-753/1+2; AD-420850)

"Sitalls," glass-ceramic materials, can be prepared from metallurgical slag. The fused slag is converted into glass slag and the glass slag into the "sitalls." The philosophy behind the synthesis of these materials is the control of crystallization of the glass slags, which is made possible by an increase in the duration of the heat treatment in the precrystalline period. "Sitalls" have a thin-grained uniform microstructure which assures high mechanical strength. "Sitalls" should find wide use in the production of different structural materials and design elements. I.v.L.

N64-11557* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
AN EXAMINATION OF THE ROLLING-CONTACT FATIGUE PROCESS IN A CRYSTALLIZED-GLASS CERAMIC
Shelley Harrell and Erwin V. Zaretsky Washington, NASA, Dec. 1963 17 p refs
(NASA TN D-2082) OTS: $0.50

A light and electron microscopy study of the rolling-contact fatigue phenomenon in a crystallized-glass ceramic indicates that the critical incipient fatigue cracks are of subsurface origin in this material. Crack propagation was around rather than through the crystals in the matrix. Fatigue cracks independent of the subsurface cracks developed normal to and at the surface. Surface and subsurface cracks connected to form a network. The volume between the surface and the crack network crumbled to form a spall. Author

N64-11583 California U., Berkeley. Lawrence Radiation Lab.
EFFECT OF INTERFACIAL BONDING ON STRENGTH OF A MODEL TWO-PHASE SYSTEM

Donald O. Nason (M.S. Thesis) 16 Sep. 1963 31 p refs
(Contract W-7405-eng-48)
(UCRL-11011) OTS: $0.75)

Model systems consisting of tungsten spheres in a dense glassy matrix were fabricated by vacuum hot-pressing. Metal–glass interfacial adherence was achieved, while development of new crystalline phases in the glass was avoided. Interpretation rested on the existence of a model surface on which the introduction of flaws could be controlled. A new criterion based on the limitation of flaw size is advanced to explain the effect of second-phase inclusions on strength in brittle systems. The roles of surface treatment and internal stresses for bonded and nonbonded inclusions are outlined in the context of this hypothesis. Author

N64-11598 Joint Publications Research Service, Washington, D.C.
NEW ENGINEERING MATERIALS
9 Dec. 1963 27 p Transl. into ENGLISH of 2 sect. of the Russian language publ. "Novyye Materialy v Teknike", Moscow, 1962 or 1963 p 115–123 and 217–233
(JPRS-22184; OTS-63-41314) OTS: $0.75

CONTENTS:
1. SHAPING OF ARTICLES FROM THERMOSETTING PLASTICS AT LOW PRESSURE p 1–9
2. GLASS FIBER AND ARTICLES MADE FROM IT p 10–24

N64-11637* National Bureau of Standards, Boulder, Colo. Cryogenic Engineering Lab.
THE CORRELATION OF EXPERIMENTAL PRESSURE-DENSITY-TEMPERATURE AND SPECIFIC HEAT DATA FOR PARAHYDROGEN [CORRELATION ENTRE LES DONNEES EXPERIMENTALES DE P-ρ-T ET LA CHALEUR SPECIFIQUE POUR LE PARAHYDROGENE]
H. M. Roder, L. A. Weber, and R. D. Goodwin [1963] 5 p refs (Supported by NASA)
(NBS-R-45)

Values of pressure–density–temperature and of heat capacities of parahydrogen at constant volume, in the temperature range from 14° to 100° K, and at pressures from 2 to 350 atm, are presented. The data on these two types of values are correlated to yield a self-consistent set of thermodynamic functions. I.v.L.

N64-11766 Chemical and Metallurgical Research, Inc., Chattanooga, Tenn.
DIRECTORY OF GRAPHITE AVAILABILITY [Report, Oct. 1962–Jul. 1963]
Julian Glasser and William E. Few Wright-Patterson AFB, Ohio, AF Materials Lab., Sep. 1963 273 p
(Contract AF 33(616)-6288)
(ASD-TDR-63-853; AD-422700)

This directory was prepared for the purpose of assisting development, application, and design engineers in the rapid identification of graphite materials and sources of supply. A total of 207 graphite products are characterized by type, manufacturing methods, analyses, and properties. For each of these products, supplier's availability on grades, sizes and shapes, price, rate or capacity of production, and delivery times are shown. Author

N64-11789 Argonne National Lab., Ill.
VARIABLY CURING RESINS FOR MOUNTING METALLOGRAPHIC SAMPLES
O. L. Kruger, J. P. Hughes, and F. J. Schmitz Sep. 1963 40 p refs
(Contract W-31-109-eng-38)
(ANL-6712)

In the past, heat- and pressure-curing resins have been used almost exclusively as mounting materials for metallographic samples. Now, however, certain polyester resins, which are curable at room temperature, are equally good for this purpose, and with their versatility they adapt readily to a variety of mounting conditions. A study of the epoxies and polyesters was made to determine which type of resin would satisfy the desirable properties of a metallographic mount. Four polyester resins were selected and investigated intensively to ascertain the variables associated with their curing processes. The results are compared with the standard thermosetting mounting material, bakelite. Author

N64-11810* Douglas Aircraft Co., Inc., Santa Monica, Calif. Missile and Space Systems Div.
INVESTIGATION OF STRUCTURAL PROPERTIES OF FIBER GLASS FILAMENT-WOUND PRESSURE VESSELS AT CRYOGENIC TEMPERATURES Monthly Progress Report No. 4, 1-31 Oct. 1963
J. M. Toth, Jr. 7 Nov. 1963 37 p refs
(NASA Contract NAS3-2562)
(NASA CR-55023) OTS: $3.60 ph, $1.31 mf

The current status of the program is as follows: (1) All of the liner materials have been tested as coupons except the glass-flake material. This material did not appear too satisfactory as a liner, and an attempt has been made to secure a better quality laminate. (2) Biaxial testing of liner materials has been held up due to hookup and checkout problems with the vacuum systems. (3) The design and fabrication of the mobile cryogenic pump cart have been completed. All of the electrical installation has been completed. (4) A 15-mil nickel specimen has been fabricated for use as the "battleship" liner. The specimen will be used for the initial burst test with hydrogen. I.v.L.

N64-11929 Southern Research Inst., Birmingham, Ala.
THE DETERMINATION OF DESIGN CRITERIA FOR GRADE CFZ GRAPHITE First Progress Report, 1 Jul.–30 Sep. 1963
C. D. Pears 31 Oct. 1963 55 p refs
(Contract AF 33(657)-11298)
(AD-423744) OTS: $5.60

Layout drawings for specimens from two CFZ graphite blocks were completed, and identification procedures were established. Preliminary work on specimen configurations, flag attachments, equipment assembly, and other areas is in progress. Preliminary arrangements to perform the radiographic examination of specimens were completed. Author

N64-11992* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
EVAPORATION RATES FOR VARIOUS ORGANIC LIQUID AND SOLID LUBRICANTS IN VACUUM TO 10^{-8} MILLIMETER OF MERCURY AT 55° TO 1100° F
Donald H. Buckley and Robert L. Johnson Washington, NASA Dec. 1963 28 p refs
(NASA TN D-2081) OTS: $0.75

The fluids examined were polyphenyl ethers, silicones, and polyalkylene glycols; the solids included fluorocarbon telomers, polytetrafluoroethylene (PTFE), polychlorotrifluoroethylene (PCFE), and two phthalocyanines (metal free and copper). Some greases were also examined. Variations in molecular weight influenced

evaporation rate markedly as indicated by the Langmuir equation. With five polyalkylene glycol fluids having different compositions but approximately the same molecular weight (1000), no essential difference in evaporation rates could be measured from 50° to 450° F. A similar dependence of evaporation rate on molecular weight was noted for the solids—telomers PTFE, and PCFE. Author

N64-12005* Aeronutronic, Newport Beach, Calif.
THE COMPOSITE BEHAVIOR OF FILAMENT-WOUND MATERIALS
Stephen W. Tsai, George S. Springer, and Albert B. Schultz [1963] 25 p refs Presented at the 14th Intern. Astron. Congr., Paris, 25 Sep.–1 Oct. 1963
(NASA Contract NAS7-215)
(IAC Paper 139)

Filament-wound structures consist of the lamination of layers of unidirectional glass filaments imbedded in an epoxy resin matrix. Taking into account the heterogeneity and anisotropy of the unidirectional layer, the composite properties of the layer are expressed analytically as functions of the material and geometric parameters of the constituent materials. Based on experimental results, this theory is shown to be more exact than the conventional netting analysis. The contribution of each material and geometric parameter to the composite behavior of the unidirectional layer can be determined. In addition, optimization of filament-wound structures from the materials standpoint can be readily achieved. Author

N64-12021 College of Aeronautics, Cranfield (Gt. Brit.)
CHARACTERISTICS OF THE HIGH TEMPERATURE MECHANISMS OF CREEP AND RECOVERY IN GRAPHITE Final Technical Sheet No. 1, Aug. 1, 1962–Jul. 31, 1963
Aug. 1963 25 p refs
(Contract DA-91-591-EUC-2629)
(CoA Note MAT.I; AD-420818)

An apparatus has been developed for determining the high-temperature creep and recovery characteristics of graphite by applying torsional stresses to thin-walled tubes. This method has the advantages of a simple stress system, constant stress for constant load, easy rapid removal of load, and the independence of the strain measurement from thermal expansion. Torsional stress-strain curves show a decreasing modulus with increasing temperature from 2000° to 2850° C. The rate of creep in this range is increased by increasing temperature and stress. Recovery rate is not so sensitive to increasing temperature. Using a method developed for metals, where recovery can be subtracted from forward creep, a secondary creep rate is deduced. This rate, when plotted according to the Arrhenius' equation, yields an activation energy for secondary creep of 154 kcals over the temperature range of 2100° to 2700° C. These results are critically examined and the future extension of the work discussed. Author

N64-12041 California U., Livermore Lawrence Radiation Lab.
BERYLLIUM OXIDE FOR NUCLEAR PROPULSION APPLICATION
A. J. Rothman 1 Jul. 1963 55 p refs Presented at a Symp. on Ceramics in Aerospace Technol., UCLA Jan. 29, 1963
(Contract W-7405-eng-48)
(UCRL-7428) OTS: $1.25

Consideration was given to those characteristics of beryllium oxide relevant to nuclear reactor systems for propulsion. Various properties of single crystal and polycrystalline beryllium oxide were studied, followed by investigations of beryllium oxide technology and fabrication, and discussions of the effects of irradiation on beryllium oxide. C.L.W.

N64-12044 General Electric Co., Philadelphia, Pa. Missile and Space Div.
INVESTIGATION OF BONDING IN OXIDE-FIBER (WHISKER) REINFORCED METALS Quarterly Report No. 2, 1 Oct.–31 Dec. 1962
Willard H. Sutton Watertown, Mass. Army Mater. Res. Agency Jan. 1963 15p refs
(Contract DA 36-034-ORD-3768RD)
(AMRA CR 63-01/2; AD-406833)

The reinforcement of metals by ultrahigh-strength single-crystal fibers offers a new means to greatly improve their strength over wide temperature ranges. One of the major problems to be solved is the attainment of high-strength interfacial bonds between the whiskers and metal matrix. The purpose of this program is to investigate the factors affecting the interfacial bonding which will lead ultimately to the development of high-strength composites. This report discusses some preliminary studies on interactions between Ni and αAl_2O_3 at elevated temperatures. A sessile drop apparatus was completed and is currently being calibrated for studies on wetting (contact angle) and interfacial energies. Author

N64-12056 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
METHOD OF OBTAINING LITHIUM GREASES
M. K. Badayeva, K. P. Grinevich 20 Aug. 1963 4 p Transl. from Russian Patent no. 151755 (Appl. No. 749725/23-5) Oct. 1961 p 1–2
(FTD-TT-63-604/1; AD-414976)

A method is proposed for obtaining lithium greases that differs from the usual methods by the use of alkylsiliconates and arylsiliconates of aluminum, or diphenylester of methylphosphinic acid, as stabilizers. R.T.K.

N64-12092 Atomic Energy of Canada Ltd., Chalk River, Ontario
THE LENGTH CHANGES OF ZIRCALOY SHEATHED UO_2 FUEL ELEMENTS DURING IRRADIATION
M. J. F. Notley and A. Harvey Aug. 1963 38 p refs
(CRFD-1174; AECL-1846) AEC of Canada: $1.00

An instrument was developed to measure the length changes of rod-type fuel elements during irradiation. The instrument, based on an air gage principle, was shown to behave satisfactorily, with a measurement stability over two months within about ±0.004 in. The measured axial expansions of two Zircaloy-sheathed UO_2 fuel elements are explicable by considering the UO_2 pellets to have a plastic core, the expansion being dictated by the thermal expansion of the innermost nonplastic ring of UO_2 or of the point of pellet to pellet contact (for a pellet with a dished end face). The temperature at which UO_2 can deform plastically depends on the stress and time of application of stress. In this experiment, plastic flow was deduced to have occurred at 750° C and probably took place at temperatures as low as 400° C at localized points of contact between pellets. Author

N64-12101* General Electric Co., Schenectady, N.Y. Advanced Technology Labs.
DEVELOPMENT OF LOW TEMPERATURE DIELECTRIC COATINGS FOR ELECTRICAL CONDUCTORS Quarterly Report No. 9

K. N. Mathes 15 Oct. 1963 110 p refs
(NASA Contract NAS8-2442)
(NASA CR-52931) OTS: $9.10 ph, $3.50 mf

A description is given of the two types of multiple conductors being developed, bundled round wire and parallel conductor ribbon cable, and the equipment to be used for refluxing cryogenic liquids. A detailed report on European activities concerned with cryogenic liquids and nonmetallic materials at cryogenic temperatures is also included. R.T.K.

N64-12105* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
FRICTION, WEAR, AND DECOMPOSITION MECHANISMS FOR VARIOUS POLYMER COMPOSITIONS IN VACUUM TO 10^{-9} MILLIMETER OF MERCURY
Donald H. Buckley and Robert L. Johnson Washington, NASA, Dec. 1963 30 p refs
(NASA TN D-2073) OTS: $0.75

Experiments were conducted with various polymer compositions in vacuum (10^{-9} mm Hg) to determine the friction, the wear, the decomposition mechanisms, and the evaporation rates of one of these materials. The materials included the basic polymers polytetrafluoroethylene (Teflon, PTFE), polychlorotrifluoroethylene (PCFE), and polyimide. In addition, experiments were conducted on these polymers with various fillers incorporated into their structures. Experimental results for PTFE indicate that certain fillers (glass fiber and copper powder) markedly improve the friction and wear characteristics of some polymers (PTFE) in vacuum, while others (molybdenum disulfide, MoS_2) offer essentially no improvement. The apparent nature of wear and the decomposition mechanism for polymer compositions, during the sliding process in vacuum, are considered related to the frictional heat generated at the sliding interface and the means for its dissipation. The polyimide polymer compositions were found to have relatively good friction and wear properties in a vacuum (10^{-9} mm Hg) and are stable in vacuum at ambient temperatures to 500° F. Author

N64-12128 Mound Lab., Miamisburg, Ohio
REACTOR FUELS AND MATERIALS DEVELOPMENT – PLUTONIUM RESEARCH: JULY-SEPTEMBER, 1963
L. J. Wittenberg Washington, AEC, 11 Nov. 1963 23 p refs
(Contract AT(33-1)-GEN-53)
(MILM-1171)

Research activities in the following areas are discussed: (1) phase studies—plutonium-yttrium phase diagram, plutonium-cerium-nickel ternary system, plutonium-cerium-copper ternary system, and cerium purity; (2) physical properties—density of praseodymium, viscosity of plutonium-iron and plutonium-cerium-cobalt molten alloys, and vapor-pressure studies (zinc and cadmium); and (3) plutonium ceramics—plutonium dioxide microspheres and plutonium-bearing glass spheres. P.V.E.

N64-12269 Battelle Memorial Inst., Columbus, Ohio
REFRACTORY CERAMICS OF INTEREST IN AEROSPACE STRUCTURAL APPLICATIONS – A MATERIALS SELECTION HANDBOOK Technical Report [Mar. 1962–Jul. 1963]
J. R. Hague, J. F. Lynch, A. Rudnick, F. C. Holden, and W. H. Duckworth Wright-Patterson AFB, Ohio, AF Mater. Lab., Oct. 1963 456 p refs
(Contract AF 33(657)-8326)
(RTD-TDR-63-4102; ASD-TDR-63-4102; AD-423400)

The materials covered are nonmetallic, inorganic crystalline materials with melting points above 2730° F (1500° C), including intermetallic compounds and excluding glass, carbon, and graphite. The data are from literature published prior to 1962. The data are presented first by property, under the headings density, melting or decomposition temperature, specific heat, thermal conductivity, thermal expansion, elastic modulus, and bend strength. Then, detailed properties of each of nearly 600 materials are presented according to nominal material composition. Author

N64-12293 University Coll. of Wales, Aberystwyth (Gt. Brit.) Edward Davies Chemical Lab.
SPECTROSCOPIC STUDIES, PART 2. THE INFRA-RED SPECTRA AND STRUCTURE OF METHOXYACETONITRILE AND METHYL-CHLOROMETHYLETHER Technical Note No. 5
R. G. Jones and W. J. Orville-Thomas 30 Aug. 1963 27 p refs
(Contract AF 61(052)-691)
(AFCRL-63-758; AD-423939)

The infrared spectra of methoxyacetonitrile and methylchloromethyl-ether have been studied in solution and in the vapor and liquid states. In the vapor state the band contours prove that the molecules are most stable when they have a slightly twisted trans conformation. Author

N64-12315 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
EFFECT OF LIQUID PHASE ON THE PROCESS OF SILICA CRYSTALLIZATION
V. A. Bron 10 May 1963 5 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSSR (Moscow), v. 59, no. 3, 1948 p 535–536
(FTD-TT-63-512/1+2; AD-413591)

Experiments to determine the role of admixtures as catalysts in promoting recrystallization of silica are discussed. A series of oxides were used as mineralizers in studying the development temperatures of melts in binary silicaminerlizer systems. The tridymite content and the dimensions of the silica crystals were determined petrographically. The data showed that the degree of tridymidization is not determined by the amount of melt formed, but by its melting point and consequently by the mobility at maximum heating temperatures. A tridymidization curve showed that the temperature of melt formation for any given mineralizer is acceptable up to 1300° to 1350° C, after which there is a sharp reduction on the degree of tridymidization and a reduction in the dimensions of the tridymite crystals. P.V.E.

N64-12336* Texas Instruments Inc., Dallas, Tex.
NEW HIGH TEMPERATURE INFRARED TRANSMITTING GLASSES Semiannual Technical Summary Report No. 2, 1 May–31 Oct. 1963
A. Ray Hilton, Charlie E. Jones, and Maurice J. Brau 1963 35 p refs
(Naval Research Contract 3810(00); ARPA Support)
(TI-08-63-167; AD-424549)

Evaluation of three-component (ternary) non-oxide glasses made from elements from groups IVA, VA, and VIA as possible high temperature (500° C) infrared window materials is continuing. Of particular importance are materials that can be used to take advantage of the atmosphere windows at 3μ to 5μ and 8μ to 14μ. Systems evaluated are the Ge-P-S, Ge-P-Se, and Ge-As-Te. The Ge-P-S and Ge-P-Se glasses are quite similar and show promise as moderate temperature (>400° C) window materials for the 3μ to 5μ application. The Ge-As-Te glasses are of excellent optical quality (no appreciable absorption from 2μ to 18μ) but have low softening points (~200° C). Blends of individual glasses from different glass systems were prepared in an attempt to

improve optical properties. The attempts were unsuccessful and indicate blending should be carried out one element at a time in small incremental amounts. The results of more careful characterization of the most promising glass compositions are given. Author

N64-12344 Picatinny Arsenal, Dover, N.J. Feltman Research Labs.
INSPECTION OF THICK POLYETHYLENE SECTIONS BY RADIOGRAPHY AND FLUOROSCOPY
James Begley Oct. 1963 15 p refs
(PA-TM-1145; AD-423389)

A 12-inch × 12-inch × 1 1/2-inch penetrameter was made from high-density polyethylene containing less than 10% amorphous boron. Fourteen other blocks of the same dimensions and material were fabricated; these blocks were void-free. The total thickness of the test specimen was 22 1/2 inches, including the penetrameter. A series of tests was run to determine the detectability of various size voids through different thicknesses of material. Test results showed that, using a cobalt-60 source, voids 1/2 inch long × 1/8 inch deep were detectable through the entire 22 1/2 inches of borated polyethylene. In an attempt to use a similar technique as a rapid scanning process, X-ray equipment (150 kv) was teamed with image intensification on a fluoroscopic screen, and results are given. Author

N64-12355 Argonne National Lab., Ill. Metallurgy Div.
PRELIMINARY IRRADIATIONS OF PuC AND UC-PuC
J. H. Kittel, L. A. Neimark, R. Carlander, O. L. Kruger, and R. C. Lied Sep. 1963 17 p refs
(Contract W-31-109-eng-38)
(ANL-6678; supersedes sections of Rept. ANL-6330; ANL-6516; and ANL-6677)

Preliminary irradiations were made of arc-cast specimens of PuC and UC-PuC and of pressed and sintered pellets of UC-PuC to determine the suitability of these materials for further development as possible fuels for liquid metal-cooled fast reactors. The PuC content in the mixed-carbide specimens was near 20 w/o. The cast PuC specimens were found to have fractured to a greater extent under irradiation than did the cast mixed-carbide specimens. Dimensional changes in those specimens which did not fracture were negligible. Fission gas release from the cast specimens was 0.24% of the theoretical yield. The pressed and sintered pellets did not fracture under irradiation and showed negligible dimensional changes. Fission gas release from the pellets was 12.0% of theoretical. Author

N64-12359 Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT OF FLEXIBLE POLYMERS AS THERMAL INSULATION IN SOLID-PROPELLANT ROCKET MOTORS
Final Summary Report, 24 Jun. 1960–23 Jun. 1963
T. R. Walton, N. Vasileff, J. V. Duffy, R. O. Thomas, and E. B. Simmons Jul. 1963 193 p refs
(Contract DA-36-034-ORD-3325-RD)
(AD-421808)

The objective of this program was to develop flexible polymers which, when suitably filled, would serve as effective case insulation in end-burning, solid-propellant rocket motors. Resin systems selected for study were the epoxies, phenolics, polyurethanes, polyesters, furans, and melamines. Flexible polymers of all six systems were prepared generally by using internal-type plasticizers or modifiers, and to a much lesser extent, by external plasticizers. The insulation performance of promising filled resins was determined by the oxyacetylene torch and static motor firing tests. Mechanical properties, aging properties, and the effect of various fillers and resin composition on insulation performance were determined for a number of the more promising resins. The best insulation developed in this program on the basis of char rate and density was a modified epoxy resin filled with 40 percent of long-fiber asbestos. Several other flexible epoxy resins were also developed which performed as well as the comparative standards. The best flexible phenolic resin was a nonylphenol-formaldehyde A-stage resin modified with a silicon-containing epoxy resin, Syl Kem 90, (3:2) filled with 45 percent of asbestos fibers. The material performed approximately the same as the better available commercial insulators. Author

N64-12364 Aberdeen Proving Ground, Md. Coating and Chemical Labs.
PROGRESS REPORT ON THE DEVELOPED DETERGENCY FUNCTION
A. Mankowich 31 Oct. 1963 15 p refs
(CCL-149; AD-423556) OTS: $0.50

The detergency (D)–solubilization (S), K_1, and K_2 functions for six additional series of soil-surfactant systems are derived ($D = K_1 S + K_2$). Examination of these intraseries K_1 and K_2 relationships together with those of the six series previously reported shows most are either the parabolic or trigonometric type. The saturated 18C fatty acid is more difficult to deterge by the 20R to 50R adducts of nonylphenol (R = ethylene oxide mole ratio) than the one or two double bond 18C acids. Apparently the double bond tends to prevent the close packing of the hydrocarbon chains, which contributes to the binding energy of the acid soils. Detergent efficiency of the 20R and 30R nonyl phenol adducts increases with increasing chain length of the 12C to 18C alkylamines, confirming previous results with 14C to 18C fatty acids. Based on the detersive efficiencies of the 20R to 50R adducts of nonyl phenol, the adsorption of the several classes of soil investigated was in the following increasing order: alcohol, amine, acid. Author

N64-12370 Naval Research Lab., Washington, D.C.
SURVEY ON METAL COATINGS OF GLASS FILAMENTS
Frank R. Fahland 15 Jun. 1963 16 p refs
(NRL-TM-237; AD-421008)

The results of a literature search on metal coatings of glass filaments are presented. Areas surveyed include types of metals used to coat fibers, coating techniques used, thickness of coating, effects of metal coating upon glass filaments, and glass compositions. It is concluded that the research work thus far conducted on metal coatings of glass filaments does not provide information sufficient to determine the protective or strength-enhancing capabilities of such coatings in a marine environment. J.E.T.

20 MATHEMATICS

Includes calculation methods and theory; computers; data processing; and numerical analysis. *For related information see*: 08 Communications; 09 Electronics; 10 Facilities, Research and Support; and 22 Navigation and Guidance.

N64-11456 Michigan U., Ann Arbor, Inst. of Science and Tech.
ANALOG SIMULATION OF A THREAT WARNING PROCESSOR
J. Beard, O. Poree, and P. Wierenga Oct. 1963 34 p refs
(Contract AF 33(616)-8108)
(Rept. 4479-26-T; ASD-TDR-63-850; AD-423194)

The feasibility of calculating two threat estimators for warning aerospace vehicles of attack has been investigated by analog simulation. The first of these estimators is the ratio of range (between target and attacking vehicle) to its time derivative (range rate). The second estimator is related to the first, and represents a more complicated function of range. Simulation results are presented for Mach 1, 2, and 3 aircraft attacked by surface-to-air missiles. The results confirm that the threat estimators can be easily calculated in the presence of noise distortion of the input range information. The first estimator is more useful with linear but noisy range data; the second one is more useful with range data which are nonlinearly distorted. Author

N64-11460 University of Southern Calif., Los Angeles
DYADIC GREEN'S FUNCTION FOR A RADIALLY INHOMOGENEOUS SPHERICAL MEDIUM
Cavour W. H. Yeh May 1963 17 p refs
(Contract AF 19(604)-6195)
(USEC 82-212; EE-28; AFCRL-63-345; AD-422596)

The general expression for the dyadic Green's function in a radially inhomogeneous dielectric medium is obtained. It is then applied to the problem of radiation from an electric dipole in such a medium. Possible applications to electromagnetic scattering problems, and to elementary particle scattering problems, are noted. Author

N64-11476 Los Alamos Scientific Lab., N. Mex.
KIWI B-1B CONTROL SYSTEMS TEST CELL "A"
Elliot Rappaport 19 Nov. 1963 174 p
(Contract W-7405-eng-36)
(LAMS-2966) OTS: $2.75

This report covers the automatic control systems for KIWI B-1B, Test Cell A. For each system discussed, an analysis is included which gives a simplified mathematical model and the controls required. The mathematical system model is then built of analog computer components so that the controls can be checked out. Some approximations are necessary to work within the hardware constraints. Author

N64-11531 Joint Publications Research Service, Washington, D.C.
PROGRAMMING THE PROBLEM OF ESTABLISHING A DIAGNOSIS FOR ELECTRONIC COMPUTERS
K. O. Shkabara and S. P. Khozyainova *In its* Translations from Avtomatyka (Automation), v. 7, no. 3, 1962 18 Feb. 1963 p 32–41 refs (See N64-11529 03-01) OTS: $2.25

The use of electronic computers for establishing a diagnosis, and the need for working out algorithms and logical schemes for the diagnostic process were investigated. A program was established for diagnosing cardiac ailments. R.T.K.

N64-11532 Joint Publications Research Service, Washington, D.C.
THE RULE OF BACK CODE CONVERSION AND ITS APPLICATION TO THE CONSTRUCTION OF CIRCUITS OF DIGITAL CODE CONVERSION
O. S. Belima *In its* Translations from Avtomatyka (Automation), v. 7, no. 3, 1962 18 Feb. 1963 p 42–53 (See N64-11529 03-01) OTS: $2.25

Circuits for the following code converters are discussed: (1) converter of decimal code into binary decimal and number-pulse codes; (2) converter of binary code into Gray's binary code; and (3) converter of binary code of numbers into a number-pulse and binary decimal codes. R.T.K.

N64-11565 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
FUNCTIONAL POSSIBILITIES AND THE SYNTHESIS OF THRESHOLD ELEMENTS [AND] ON THE COMPLEXITY OF SCHEMES WITH A DEPTH TWO BUILT OF THRESHOLD ELEMENTS
V. I. Varshavskii [1962] 20 p Transl. into ENGLISH of 2 articles from Dokl. Akad. Nauk SSSR, v. 139, no. 5 and 6, 1961 p 1071–1074 and 1325–1328
(MH Transl. 347)

A number of theorems and procedures are presented that deal with the realization of general invariable logic expressions by threshold logic elements. Author

N64-11566 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
ON THE DETERMINATION OF THE UNIFORMLY ACCURATE SOLUTIONS TO DIFFERENTIAL EQUATIONS BY MEANS OF THE METHOD OF THE PERTURBATION COORDINATES
M. F. Pritulo [1963] 12 p refs Transl. into ENGLISH from Prikl. Mat. i Mekh. (Moscow) v. 26, no. 3 May–Jun. 1962 p 444–448
(MH Transl. 413)

When looking for the approximate solutions of differential equations containing a certain parameter, ϵ, the method applied consists of the expansion of the accurate solution in a series with respect to the powers of ϵ, and the computation of several of its first coefficients. An analogous procedure is used when the small parameter is not included in the differential equation, but only in the boundary conditions. Quite frequently, the solution of the zero order has special surfaces inside the domain, which are not characteristic for the accurate solution of the equation. In solutions of a higher order, these peculiarities are not only preserved, but become expressed more sharply. Consequently, near such special surfaces the series is diverging with respect to the powers of ϵ, and the method of the small parameter does not yield the solution. The difficulties can be eliminated, if not only the unknown function, but also the independent variables, are expanded in a series with respect to the powers of ϵ. Author

N64-11568 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
THE INVESTIGATION OF THE CONVERGENCE DOMAINS OF THE COORDINATE EXPANSIONS OF UNDISTURBED MOTION
N. B. Elenvskaya [1963] 24 p refs Transl. into ENGLISH from Astron. Zh. v. 39, no. 5, Sept.–Oct. 1962 p 938–950
(MH Transl. 422)

The possibility is considered of expansion of the eccentric anomaly, and the coordinates of undisturbed motion, in a power series in the eccentricity increment ($e-e_0$). The convergence of such a series for elliptical and hyperbolic motions is investigated. An equation is obtained for the so-called particular curve of Keplerian motion. This curve limits the region of the complex plane, in which there exists a finite circle of convergence for any given value of the eccentricity e. Expansions of the eccentric anomaly and its functions, converging not along the whole trajectory, but only up to definite values of the mean anomaly, are considered. Two such expansions are studied: in a power series (1–e), where e is the eccentricity of the orbit of a moving point, and in a Fourier (or Loran) series in multiples of the eccentric anomaly. As is shown, the regions of these expansions will partially overlap. Author

N64-11569 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group

ON THE CONDITIONS FOR THE ORTHOGONALITY AND EQUIVALENCE OF GAUSSIAN MEASURES IN THE FUNCTIONAL SPACE

V. G. Alekseev [1963] 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Mat. v. 147, no. 4, 1962 p 751–754 (MH Transl. 423)

It is well known that the Gaussian measures in the functional space of samples, corresponding to two different random processes, can be either equivalent or orthogonal. However, the available necessary and sufficient conditions for the equivalence of the Gaussian measures are all not sufficiently effective, in the sense that their testing for concrete processes represents an extremely complicated and as yet unsolved problem. The present note contains certain new sufficient conditions for the orthogonality and equivalence of measures, corresponding to intervals of the real random processes, with stationary Gaussian increments, and a mean 0. Author

N64-11570 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group

ON THE GENERAL THEORY OF REDUCED ACCELERATIONS IN TANGENTIAL COORDINATES

D. Mangeron and E. Croitoru [1963] 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Mat. v. 148, no. 1, 1963 p 54–56
(MH Transl. 424)

In a series of recently published articles, the class of linearly enveloping curves of the connecting-rod, and their Cartesian equations in a parametric form have been investigated. The advantage of a systematic use of the methods for tangential geometry has been indicated in investigations, concerning: (1) envelopes of certain straight lines, connected with units of mechanisms in a complicated spatial motion; and (3) dual problems, i.e., ruled surfaces, formed by certain straight lines, connected with units of mechanisms in a complicated spatial motion. Author

N64-11572 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group

ON THE STABILITY IN THE SENSE OF JACOBI

V. V. Stepanov [1963] 20 p refs Russian Translation
(MH Transl. 426)

A solution of a system of ordinary differential equations is defined as stable in the sense of Jacobi if the corresponding variational equations are stable. Motion in the plane under general potential forces is investigated, and some theorems and examples are given. Author

N64-11573 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group

ON THE THEORY OF THE STABILITY OF MOTION

V. M. Matrosov [30 Jun. 1962] 21 p refs Transl. from Russian into ENGLISH
(MH Transl. 428)

In this paper an attempt is made to obtain criteria for the stability of motion using several V functions simultaneously. Further, each V function can satisfy less rigid requirements than the requirements in the corresponding theorem of Liapunov's second method. The use of several V functions might lead to a more flexible apparatus. Author

N64-11574 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group

ON ONE METHOD FOR THE RECOGNITION OF OBJECTS, DESCRIBED BY SEVERAL PARAMETERS, AND ON THE POSSIBILITIES OF ITS APPLICATIONS

V. L. Brailovskii Mar. 1963 23 p refs Transl. into ENGLISH of an article from Avtomat. i Telemekh. (Moscow), v. 23, no. 12, 1962 p 1643–1653
(MH Transl. 429)

An algorithm classifying objects (described by a rather small number of discrete parameters) into two groups is considered. Signs according to which the objects are classified are produced by the algorithm in the process of learning. Some results of applying this algorithm for the solution of several problems of classification with the help of a digital computer are described. Possible applications of such an algorithm are stressed. Author

N64-11577 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group

THE QUESTION ON THE CONSTRUCTION OF THE SOLUTIONS OF LINEAR DIFFERENTIAL EQUATIONS WITH SLOWLY CHANGING PARAMETERS

V. L. Panteleev Jul. 1963 10 p refs Transl. from Russian into ENGLISH of an article from Vestn. Mosk. Univ., no. 2, 1963 p 25–29
(MH Transl. 460)

The problem on the determination of the solution of linear differential equations with slowly changing parameters is reduced to the finding of the perturbed frequency for the oscillation of the system, close to the frequency of natural oscillations, by means of the iteration method. As an example, the motion of a pendulum on a vertically oscillating support has been considered. Author

N64-11599 Joint Publications Research Service, Washington, D.C.

THE POSSIBILITY OF MODELING THOUGHT FUNCTIONS

Ya. R. Gasul' 9 Dec. 1963 10 p refs Transl. into ENGLISH of an article from Fiziol. Zhur., Akad. Nauk Ukr. RSR (Kiev), v. 8, no. 6, 1962 p 790–795
(JPRS-22185; OTS-63-41315) OTS: $0.50

A discussion is presented of the degree to which self-regulatory processes in automatons are analogous to some processes of higher nervous activity, particularly that of man. R.T.K.

N64-11611 Joint Publications Research Service, Washington, D.C.

ON A NON-LINEAR PROBLEM OF OPTIMUM CONTROL. PROBLEM FORMULATION, OPTIMUM CONTROL STRUCTURE, FIRST INTEGRALS

V. K. Isayev and V. V. Sonin *In its* Transl. from Avtomat. Telemekh. (Automation and Telemechanics) [Moscow], v. 23, no. 9, 1962 21 Feb. 1963 p 1–20 refs (See N64-11610 03-01) OTS: $2.25

By means of the maximum principle some variational nonlinear problems of rocket dynamics are studied. The optimum control structure is analyzed, assuming that the field of permissible values of the control actions is bounded. First integrals of corresponding equations of the optimum motion are proposed. Author

N64-11612 Joint Publications Research Service, Washington, D.C.

ON THE SOLUTION OF SOME PROBLEMS OF DYNAMIC PROGRAMMING THEORY BY ELECTRONIC COMPUTERS

Nhuen Than Bang *In its* Transl. from Avtomat. i Telemekh. (Automation and Telemechanics) [Moscow], v. 23, no. 9, 1962 21 Feb. 1963 p 21–36 refs (See N64-11610 03-01) OTS: $2.25

Solution by electronic computer is proposed for the Bulgakov problem of disturbance accumulation and for the problem of "hitting" (according to the Roytenberg formulation) in nonstationary linear systems. The maximum accumulated deviation value of the k-coordinate up to a previously set moment of time is calculated. The law of change of the additional external forces providing the given motion of the phase coordinates is found. An example is given. Author

N64-11613 Joint Publications Research Service, Washington, D.C.
APPLICATION OF GAME THEORY TO SOME PROBLEMS OF AUTOMATIC CONTROL, 2
M. Yu. Gadzhiyev *In its* Transl. from Avtomat. i Telemekh. (Automation and Telemechanics) [Moscow], v. 23, no. 9, 1962 21 Feb. 1963 p 37–52 refs (See N64-11610 03-01) OTS: $2.25

Well-known basic equations are considered, which determine the solutions of the game in the general cases. Some examples which illustrate the theoretical results are presented. Author

N64-11615 Joint Publications Research Service, Washington, D.C.
MINIMIZATION OF LOGICAL FUNCTIONS OF A LARGE NUMBER OF VARIABLES
V. D. Kazakov *In its* Transl. from Avtomat. i Telemekh. (Automation and Telemechanics) [Moscow], v. 23, no. 9, 1962 21 Feb. 1963 p 75–83 refs (See N64-11610 03-01) OTS: $2.25

The algorithm of the minimization of incompletely specified logical functions is considered. With the help of electronic computers (universal or specialized) the algorithm permits the finding of almost minimum expressions for functions of up to twenty variables. An example of the application of the algorithm is described. An approximate evaluation of a number of elementary steps in the minimization of a function of n variables is proposed. Author

N64-11616 Joint Publications Research Service, Washington, D.C.
CHRONICLE: SEMINAR ON THE THEORY AND APPLICATION OF DISCRETE AUTOMATIC SYSTEMS
R. S. Rutman *In its* Transl. from Avtomat. i Telemekh. (Automation and Telemechanics) [Moscow], v. 23, no. 9, 1962 21 Feb. 1963 p 84–87 refs (See N64-11610 03-01) OTS: $2.25

A short summary is presented of papers presented at a seminar on the theory and application of discrete automatic systems. P.V.E.

N64-11625 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
ON ANALYTIC METHODS IN THE THEORY OF PROBABILITY
A. Kolmogoroff [1960] 50 p Transl. into ENGLISH from Math. Ann. (Leipzig), no. 104, 1931 p 415–458
(MH-Transl. 197)

A stochastic process, resulting from the variation of a physical system, is called stochastically-defined, if a deterministic description of the state, X_0, of the physical system at an instant, $t>t_0$, also implies that the distribution function of the probabilities of the possible state, X, of the associated stochastic process is also known at the instant, t. The simplest examples of stochastically-defined processes are considered, with special emphasis on those processes which are continuous with respect to time. Previously, stochastic processes were usually considered as a series of discrete events. If the set of possible states of the system is finite, the stochastically-defined process can be characterized by a set of linear, ordinary, differential equations. If the possible states of the system are described in terms of one or more continuous parameters, then the analytic description of samples is in terms of solutions of linear, parabolic, differential equations. The solutions of the associated differential equations yield various probability distribution functions, among which Laplace's normal distribution function has the simplest analytic description. Author

N64-11626 Minneapolis-Honeywell Regulator Co. Minn. Military Products Group
ON POLYNOMIAL STATISTICS IN CONNECTION WITH THE ANALYTIC THEORY OF DIFFERENTIAL EQUATIONS
Yu. V. Linnik [1961] 22 p refs Transl. into ENGLISH from Vestn. Leningr. Univ., Ser. Mat., Mekh., 1 Astron. no. 1, 1958 p 35–48
(MH-Transl. 282)

One of the extremely interesting and difficult analytic problems in mathematical statistics is the study of the phenomenon of the stochastic independence of two or more statistics, i.e., the classification of the laws for the distribution of the vector of θ, under which the statistics $S_1(\theta)$ and $S_2(\theta)$ turn out to be stochastically independent. The difficulty of this problem is that it leads to nonlinear differential and integro-functional equations of a noninvestigated type and even, in the simplest cases, to the unsolved problems in the analytic theory of differential equations. Author

N64-11633 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
THE APPLICATION OF THE THEORY OF OPTIMAL PROCESSES TO PROBLEMS IN THE APPROXIMATION OF FUNCTIONS
V. G. Boltyanskii [1963] 20 p refs Transl. into ENGLISH from Tr. Mat. Inst., Akad. Nauk SSSR, v. 60, 1961 p 82–95
(MH-Transl. 432)

Given a Reasonably smooth function, y(t), on a $\leqslant t \leqslant b$,find a function, x(t), satisfying

$$\frac{d^n \times (t)}{dtn} \epsilon \text{ Lip } \alpha, t\epsilon [a,b]$$

which minimizes a functional of the form:

$$J = \int_a^b F[x(t), y(t)]\, dt.$$

The existence and uniqueness of the solution of this variational problem under suitable restrictions placed upon the functional, J, is demonstrated. The author then recasts the problem in terms of the following optimal control problem. Given a reasonably smooth function, y(t), on a $\leqslant t \leqslant b$, find a control function, u(t), from the class of measurable control functions on [a, b], $|u(t)| \leqslant \alpha$, such that the functional

$$\int_{t_0}^{t_1} F[x, \dot{y}(x^{n+2})]\, dt$$

is minimized. How to construct the solution (where uniqueness exists) is shown by the methods associated with Pontriagin's Maximum Principle. Author

N64-11639 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
THE AVERAGING IN SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS

V. M. Volosov [1962] 165 p refs Transl. into ENGLISH (MH-Transl.-435)

A review is presented of the averaging method, applied in the investigation of oscillating processes described by ordinary differential equations. Section 1 presents outlines of investigations, connected with the development of asymptotic methods, where averaging was applied. In Section 2, questions concerning the proofs of the averaging method are discussed, theorems on averaging are stated, general ideas are presented for the proof of similar theorems, and a number of examples appearing in physics and technology are discussed. Section 3 deals with the solution of problems which utilize the computation of higher asymptotic approximations of the averaging method. The last section discusses the calculations dealing with the computation of phases in oscillating processes, and periodic solutions are computed for certain self-oscillating systems. P.V.E.

N64-11652 Minneapolis-Honeywell Regulator Co. Minn. Military Products Group

THE INVARIANT DIFFERENTIAL OPERATORS AND BOUNDARY PROBLEMS (Introduction and Chapter I)

A. A. Dezin [1963] 38 p refs Transl. into ENGLISH from Tr. Mat. Inst. Akad. Nauk SSSR, v. 68, 1962 p 1–25 (MH-Transl. 466)

The structure of the Cauchy–Rieman equations was investigated from the viewpoint of the applicability of Functional methods. The possibility of indicating equations of a similar construction in a space of an arbitrary number of determinations was used as the criterion for "correctness" of the presentation. This study resulted in the unexpected separation of an entire class of first-order systems of a special structure, whose place among general first-order systems is analogous, in a certain sense, to the place of second-order classical equations with constant coefficients among other equations. The study of these systems involves, basically, the investigation of the elliptic case; the subsequent transition to the hyperbolic and the intermediate parabolic cases are extensions of the elliptic case. Chapter I deals with the determination of the basic operators d and δ, as well as the specification of certain basic facts in connection with weak and strong solutions. M.P.G.

N64-11655 Atomic Energy of Canada Ltd., Chalk River, Ontario

FREAK: A G-20 COMPUTER PROGRAM FOR MAKING FREQUENCY DISTRIBUTION TABLES

P. M. Attree Sep. 1963 59 p (AECL-1837; CRT-1167) Available from Sci. Doc. Distribution Office, Atomic Energy of Canada Ltd., Chalk River: $1.50

FREAK is a program written in APEX for the G-20 computer. It is designed to make up frequency-distribution tables, according to prescribed distributions and field definitions, from a file of records which may be on either magnetic tape or cards. Author

N64-11739* Minneapolis-Honeywell Regulator Co., Minn.

MODES OF FINITE RESPONSE TIME CONTROL

C. A. Harvey [1963] 9 p refs Submitted for Publication (NASA Contract NASw-563) (NASA CR-52929) OTS: $1.10 ph, $0.80 mf

A linear autonomous system with a single control variable is considered. There are, in general, several modes of finite response time control for such a system. The concepts of single-component regulation and multiple-component regulation are defined. It is then shown that a multiple-component regulation problem can be transformed into a single-component regulation problem. Thus it is possible to express any of the modes of control considered as control of a single input, single output system. Author

N64-11776 Iowa State U. of Science and Tech., Ames

CONVERSION OF X-RAY POWDER PATTERN MEASUREMENTS TO REFINED d-SPACINGS AND $1/d^2$; COMPUTER PROGRAM

O. D. Mc Masters and W. L. Larsen Aug. 1963 43 p refs (Contract W-7405-eng-82) (IS-683) OTS: $1.00

The preliminary calculations for the indexing of X-ray diffraction powder patterns are coded for use on an IBM 7074 computer. The diffraction line position measurements obtained from powder patterns are converted to d-spacings which are corrected for errors due to absorption of X-rays by the specimen. The d-spacings are then refined on the basis of higher order reflection data, and converted to Q (= $1/d^2$) values. Author

N64-11833 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON USSR ELECTRONICS

Ye. T. Mironchikov et al 12 Apr. 1963 27 p refs Transl. into ENGLISH of 2 articles from Radiotekh. i Elektron. (Moscow), v. 8, no. 1, Jan. 1963 p 8–23 (JPRS-18679; OTS-63-21566) OTS: $0.75

CONTENTS:

1. ON THE ARITHMETIC CORRECTING CODES Ye. T. Mironchikov and V. D. Kolesnik p 1–12 refs (See N64-11834 03-20)

2. PROBLEM OF SEARCH IN A SYSTEM WITH FINITE NUMBER OF POSITIONS K. Sh. Zigangirov p 13–24 refs (See N64-11835 03-20)

N64-11834 Joint Publications Research Service, Washington, D.C.

ON THE ARITHMETIC CORRECTING CODES

Ye. T. Mironchikov and V. D. Kolesnik *In its* Transl. on USSR Electron. 12 Apr. 1963 p 1–12 refs (See N64-11833 03-20) OTS: $0.75

Arithmetic codes which correct individual errors are described, and the properties of such codes are defined. Also, the synthesis of an error corrector is described. The corrector consists of digital filters (coding and decoding filters), which are multicycle systems built with shift registers having logical feedback. This corrector does not lower the high speed of the serial-type computer. I.v.L.

N64-11835 Joint Publications Research Service, Washington, D.C.

PROBLEM OF SEARCH IN A SYSTEM WITH FINITE NUMBER OF POSITIONS

K. Sh. Zigangirov *In its* Transl. on USSR Electron. 12 Apr. 1963 p 13–24 refs (See N64-11833 03-20) OTS: $0.75

Problems of search in a system with a finite number of positions may arise in radio reception, in detecting faults in various devices, and in the analysis of the quality of a product. This report examines two search circuits in a system with a finite number of channels: the sequential search circuit and the adjusting circuit. The statistical characteristics of both circuits are obtained, and the advantage of the adjusting circuit is discussed. I.v.L.

N64-11864 Deutsche Forschungsanstalt für Luft- und Raumfahrt, Brunswick (W. Germany)
GENERAL INTRODUCTION TO MONTE CARLO METHODS [ALLGEMEINE EINFUHRUNG IN DIE MONTE-CARLO-METHODEN]
F. Hammelrath *In* Wiss. Ges. für Luft- und Raumfahrt Operations Res. in Air- and Space-Travel [1963] p 5–13 refs In GERMAN (See N64-11863 03-16)

Monte Carlo methods are those by which a stated problem is modeled according to suitable random processes. These methods are used in finite random processes (simulation) and in treating differential and difference equations. An example of simulation is the classical "random walk." An example of equation treatment is found in the treatment of partial second-order differential equations of the elliptic and parabolic type and the corresponding difference equations. Monte Carlo methods are valuable in investigating random processes, since such processes lead to such involved mathematical problems that simulation is the only solution. Other applications may be of theoretical interest; however, it appears that, only in rare cases, do they offer an advantage over the classical approximation methods. I.v.L.

N64-11865 Bolkow-Entwicklungen K. G., Munich (W. Germany)
ON THE FUNDAMENTALS OF MONTE CARLO METHODS [UBER DIE GRUNDLAGEN DER MONTE-CARLO-METHODEN]
G. Itzelsberger *In* Wiss. Ges. für Luft- und Raumfahrt Operations Res. in Air- and Space-Travel [1963] p 14–26 In GERMAN (See N64-11863 03-16)

The purpose of this report is to elucidate certain fundamentals of Monte Carlo methods in order to facilitate the engineer's access to the literature in this field. The structure of the Monte Carlo method is presented, and the realization of a random number-generator is discussed. In addition, several examples for generating special distributions are presented, and the results of random sampling, as well as questions dealing with the evaluation of random sampling, are discussed. I.v.L.

N64-11866 Siemens and Halske, A. G., Munich (W. Germany)
EXAMINATION OF SHORT RANDOM NUMBER SERIES WITH SO-CALLED ZONE TESTS [PRUFUNG KURZER ZUFALLSZAHLENFOLGEN MIT SOGENANNTEN ZONENTESTEN]
E. Rusch *In* Wiss. Ges. fur Lüft- und Raumfahrt Operations Res. in Air- and Space-Travel [1963] p 27–64 refs In GERMAN (See N64-11863 03-16)

The problem of testing short random number groups can be adapted to the zone test method used in statistical quality control. The elements of the number groups are related to the zones. The occurrence groups are observed and evaluated. The probability of the occurrence groups is used in this evaluation. The number of group sets, which has the possibility of less than 10^{-3} (i.e., rare probability) is the determining factor for the test results. The observed number of such groupsets is compared with the limit of deviation of specially derived characteristic quantities. The information so gained indicates that the tested numbergroups, in respect to probability, contain too many or too few of the "rare" groupsets. An example of this testing procedure is presented.
Trans. by I.v.L.

N64-11867 Entwicklungsring Süd, Munich (W. Germany)
MONTE CARLO TECHNIQUES IN THE ANALYSIS OF AN AIRCRAFT MAINTENANCE ORGANIZATION
J. R. Watson (Northrop Corp.) *In* Wiss. Ges. fur Luft- und Raumfahrt Operations Res. in Air- and Space-Travel [1963] p 65–73 (See N64-11863 03-16)

A military maintenance organization is a typical complex man–machine system, largely controlled by stochastic processes. As such, it lends itself to simulation utilizing Monte Carlo techniques. This paper discusses one approach to such a simulation. This simulation is accomplished by reducing the appropriate function of the entire organization into a set of activities, each activity being characterized by a distribution of frequencies of occurrence which is dependent upon one of a number of operational variables (i.e., flight time, elapsed time, number of operations, etc.) which consume resources according to stochastic processes. The activities performed, in general, for an aircraft consist of organizational maintenance (performed by squadron), field maintenance (performed by wing), and depot (performed by logistics organizations). The results of simulation, utilizing Monte Carlo techniques, in the analysis of an aircraft maintenance organization indicate that simulation: (1) establishes the states of the system in detail as well as overall; (2) gives the distributions as well as means and deviations; and (3) allows the organization to be perturbed by events that cannot be observed in actual operation, such as the outbreak of war.
I.v.L.

N64-11891 RAND Corp., Santa Monica, Calif.
ON THE EFFICIENCY OF THREE-STAGE LEAST-SQUARES ESTIMATION
Albert Madansky Mar. 1963 22 p refs
(Contract AF 49(638-700; Proj. RAND)
(RM-3557-PR; AD-299572)

A recent contribution to estimation of the coefficients of a system of simultaneous linear equations in economics is the three-stage least-squares procedure of Zellner and Theil. This memorandum points out the relationship between this procedure and the method of instrumental variables, thus simplifying the exposition of the procedure. It further shows that the procedure yields best asymptotically normal (BAN) estimates.
Author

N64-11931 Stanford Research Inst., Menlo Park, Calif.
AN ANALYTICAL INVESTIGATION OF CERTAIN MIXED BOUNDARY VALUE PROBLEMS WITH A CIRCULAR LINE OF SEPARATION IN THE BOUNDARY CONDITIONS Final Report [15 Jan. 1962–14 Aug. 1963]
M. P. Stallybrass Nov. 1963 16 p refs
(Contract AF 19(628)-323)
(AFCRL-63-785; AD-424557) OTS: $1.60

An analytical investigation was conducted concerning the development or exploitation of mathematical techniques that would be applicable to a wide class of mixed boundary-value problems arising in steady-state elastodynamics. The main class of problems considered were those involving a rigid body that oscillates about various axes on the surface of an elastic half-space (or in the infinite region bounded by parallel planes).
C.L.W.

N64-11939 Emmanuel Coll., Boston, Mass. Research Language Center
GENERAL QUADRATIC MAPPINGS REPRESENTED BY RECTILINEAR TRIANGLE NETS [DIE ALLGEMEINEN QUADRATISCHEN ABBILDUNGEN, DARGESTELLT DURCH GERADLINIGE DREIECKSNETZE]
Robert Sauer L. G. Hanscom Field, Mass., AF Cambridge Res. Labs. [Jan. 1963] 53 p refs Transl. into ENGLISH of an article from Math. Ann. (Leipzig), v. 106, 1932 p 722–754
(Contract AF 19(604)-8505)
(E-T-G-63-5; AD-413012)

This paper deals with special pointwise mappings of planes. A Δ-mapping is considered which, within certain areas, is reversibly unambiguous and continuous and can be represented by rectilinear triangle nets. In particular, general quadratic mappings belong to this very general and extensive Δ-mapping. These general quadratic mappings contain birational (so-called Cremona) quadratic mappings as a special case. A construction method is given for rectilinear triangle nets which can be drawn with a ruler; this represents general quadratic mapping. The given construction, aside from certain special cases, is applicable to every quadratic mapping. In addition, a division of quadratic mapping into ten main types is made. The individual types are analytically described and discussed by metric normalization. I.v.L.

N64-11940 Columbia U., New York, N.Y.
ON THE ASYMPTOTIC DISTRIBUTION OF THE AUTOCORRELATIONS OF A SAMPLE FROM A LINEAR STOCHASTIC PROCESS
T.W. Anderson and A. M. Walker (Cambridge U.) 1961 16 p 9 refs
(Contracts Nonr-266(33) and Nonr-4195(00))
(CU-69-63-Nonr-266(33)MS; AD-424463) OTS: $1.60

A proof is given of the asymptotic normal distribution of the autocorrelations of a linear process under the assumption of finite second-order moments, $E(\epsilon_t) < \infty$ (which must be taken in any case to have $E(x_t) < \infty$). ϵ_t denotes a set of independently and identically distributed random variables, and x_t is a linear stochastic process. I.v.L.

N64-11954 Space Technology Labs., Inc., Redondo Beach, Calif.
COMPUTATION OF PROCESSES IN NONLINEAR SYSTEMS OF DISCONTINUOUS CONTROL [RASCHET PROTSESSOV V NELINEINYKH SISTEMAKH PRERYVISTOGO REGULIROVANIYA]
Ya. Z. Tsypkin May 1963 22 p refs Transl. into ENGLISH from Avtomat. i Telemekh. (Moscow), v. 17, no. 6, 1956 p 500–512
(STL-TRANS-76; Rept. 9990-6409-KU-000)

A method for construction of processes in discontinuous control systems of the second type (pulse-width modulated discrete systems), in which these processes are essentially nonlinear with the finite deviations of the error, is discussed. A standard system of discontinuous control with a delayed feedback is examined as an example. Author

N64-11960 Space Technology Lab., Inc., Redondo Beach, Calif.
APPLICATION OF THE THEORY OF GAMES TO PROBLEMS OF APPROXIMATION [APPLICATION DE LA THEORIE DES JEUX AUX PROBLEMES D'APPROXIMATION]
P. V. Lambert and M. F. Neuts (Universite Catholique de Louvain) Jan. 1963 41 p refs Transl. into ENGLISH from Tech. Rept. No. 9, Dec. 1961 Submitted to the European Community of Atomic Energy Under Contract 011/61/1 DOB
(STL-TRANS-72; Rept. 9990-6345-KU-000)

The following topics are considered: (1) formulation of the problem of general approximation in terms of the theory of games; (2) general principles of the theory of games related to the given approximation problem; (3) selection of the best polynomial weights in the Bernstein–Favard problem; and (4) selection of the best coefficients in the generalization of the Chebyshev problem. R.T.K.

N64-12016 Space Technology Labs., Inc., Redondo Beach, Calif.
EXTENSION OF THE GAUSSIAN QUADRATURE FORMULA TO THE CASE OF m VARIABLES (OBOBSHCHENIE KVADRATURNOI FORMULY GAUSSA NA SLUCHAI m PEREMENNYKH)
D. G. Grebenyuk Jul. 1963 12 p refs Transl. into ENGLISH from Izv. Akad. Nauk Uz SSR, Ser. Fiz. Mat. (Tashkent), no. 2, 1958 p 69–76
(STL-TRANS-77; Rept. 9990-6446-KU-000)

Starting with the general form, the Gaussian mechanical quadrature formula was extended to the case of *m* variables. C.L.W.

N64-12027* Republic Aviation Corp., Farmingdale, N.Y.
DIFFERENTIAL CORRECTION SCHEME FOR THE CALCULUS OF VARIATIONS Third Semiannual Report, Part II
21 Jul. 1963 26 p refs
(NASA Contract NAS8-2605)
(NASA CR-55016; RAC-720-6; RD-TR-63-99) OTS: $2.60 ph, $0.98 mf

A differential correction scheme is developed for the improvement of the approximate initial values of the adjoint variables so that an integral functional satisfying desired boundary conditions is optimized. The adjoint variables satisfy a system of equations that are developed by applying the classical methods of the calculus of variations, properly extended, or Pontryagin's maximum principle. Approximate initial values for the adjoint variables are assumed. A general transition matrix is derived for the variations of the end conditions caused by the variations of the initial values of the adjoint variables, including the variations of the thrusting program and of the final time of the nominal optimum trajectory. An iteration scheme also is discussed for the convergence of the differential corrections to the desired end conditions. Author

N64-12066 Joint Publications Research Service, Washington, D.C.
CERTAIN CLASSES OF GAMES AND GAMES FOR AUTOMATA
I. M. Gel'fand et al 31 Dec. 1963 11 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSSR (Moscow), v. 152, no. 1, 1963 p 845–848
(JPRS-22519; OTS-64-21164) OTS: $0.50

Experimental games simulating comparatively simple forms of collective behavior lead naturally to the discussion of certain relatively simple classes of games. This article is devoted to a description of such classes. In particular, games in which the payoff function for each player is determined by the strategies selected by a small number of players, his "neighbors", are discussed. Examples of these games include: (1) circular games; (2) plane games; (3) two-player games, in which players A_1 and A_2 take part and each player has two strategies; (4) homogeneous games for identical automata; and (5) homogeneous circular games. I.v.L.

N64-12114 Los Alamos Scientific Lab., N. Mex.
SWITCHING CIRCUIT ANALYSIS PROGRAM, SCAP-1
Lewis F. Green 25 Nov. 1963 17 p
(Contract W-7405-eng-36)
(LAMS-2986) OTS: $0.50

A switching circuit analysis program (SCAP-1) is given to aid the machine-control-design engineer in verifying the functional logic of electrical and hydraulic machine control circuitry. SCAP-1 is designed for use on an IBM-1401, Model

A3 data processor, with 132 print positions as the only required optional feature. The program uses a search and compare routine to determine the condition of circuit components. The ability to properly analyze the function of multistage components is included in the program. C.L.W.

N64-12124 Union Carbide Nuclear Co., Oak Ridge, Tenn.
THE APPLICATION OF DATA PROCESSING TECHNIQUES TO A MAINTENANCE WORK CONTROL PROGRAM
J. D. Westbrook (M.S. Thesis–Tennessee U.) 18 Dec. 1963 158 p refs
(Contract W-7405-eng-26)
(Y-1371) OTS: $2.75

A manual reporting system formed the basis around which the electronic data processed reports were designed. Designing [illegible] reports was but one aspect of system design; also involved were: modification of timekeeping and time reporting procedures; redesign of standard forms and design of several new ones; and the alteration of planning and estimating rules. The results of these efforts are that the reporting system is an integral, active part of the maintenance work control program and that a method of designing reporting systems for work control programs was established. Author

N64-12138 European Organization for Nuclear Research, Geneva (Switzerland) Data Handling Div.
MATHEMATICS, MACHINES & LOGIC
P. B. Sheridan 1 Oct. 1963 20 p refs
(CERN 63-31)

Three principal schools of mathematical thought pertaining to set-theoretic paradoxes are discussed. The schools of thought are the logistic school of Russell and Whitehead, the intuitionistic school of Brouwer, and the formalistic school of Hilbert. However, this paper places emphasis on the work of Gödel. A striking mathematical result of Gödel's, which follows as a corollary from his incompleteness theorem of 1931, is that, if a number-theoretic formal system is consistent, then there is no consistency proof for it which can itself be formalized within the system. Thus, a metamathematical consistency proof for such a system must inevitably involve methods unformalizable within the system itself. Mounting efforts have been directed toward the application of high-speed electronic digital computers in the service of metamathematical research. Theorem proving by machines has been a particularly fertile area. The basic question of whether, in fact, there exists a set of metamathematical techniques for effectively obtaining direct proofs of provable formulas in pure first-order predicate logics was settled in the affirmative by the normal form theorem of G. Gentzen. Gentzen set up a formal system for first-order predicate logic which, by strictly finitary methods, was shown to be a proof-theoretical equivalent to the classical intuitionist formulations. I.v.L.

N64-12167* Michigan U., Ann Arbor
ON REDISCOVERY OF KNOWN MEAN ERGODIC THEOREMS
Frederick J. Beutler and A. A. Wolf (Emertron, Inc.) Repr. from Proc. IEEE, v. 51, no. 7, Jul. 1963 2 p refs
(NASA Grant NsG-2-59)

Mr. Beutler raises a number of points regarding the correctness of the ergodic theorems presented in a previously published note by Mr. Wolf. Mr. Wolf's reply to these criticisms is presented. Mr. Wolf states that Mr. Beutler's counter examples actually represent nonergodic processes and therefore, rather than contradicting his (Wolf's) theorems, they demonstrate that while the process is stationary it is not ergodic. R.T.K.

N64-12183 Arinc Research Corp., Washington, D.C.
COMPUTER RELIABILITY STUDY [Final Report, 1 Jul. 1962-30 Jun. 1963]
Donald O. Baechler and David E. Van Tijn Los Angeles, Calif. Space Systems Div., Jul. 1963 217 p
(Contract AF 04(695)-147)
(SSD-TDR-63-150; AD-413019) OTS: $14.50

The problem of increasing the reliability of digital computers is approached on the basis that not all part failures result in computer failures. A measure of performance, which measures computer failures, rather than part failures, is developed. Two techniques for increasing reliability are developed, and the value of these is demonstrated by application of the measurement method. The basic logic design of a digital computer is presented. Techniques for increasing the reliability of the computer are incorporated in the design, and the measure of performance developed in the report is used to evaluate and compare the original and modified designs. Author

N64-12202 Emmanuel Coll., Boston, Mass. Research Language Center
THE THEORY OF GENERAL PLANE QUADRATIC GRAPHS [ZUR THEORIE DER ALLGEMEINEN EBENEN QUADRATISCHEN ABBILDUNGEN]
Othmar Baier Bedford, Mass., AFCRL, Jul. 1963 38 p refs Transl. into ENGLISH from Math. Ann. v. 112, p 630–651, 1936
(Contract AF 19(604)-8505)
(E-T-G-63-11; AD-424515)

Topics of discussion include: (1) definition and main characteristics of general quadratic graphs; (2) spatial arrangement of the general quadratic projection; and (3) presentation of the spatial arrangement with cones in connection with Sauer's classification of general quadratic projections. J.E.T.

N64-12206 Army Missile Command, Huntsville, Ala.
DOCUMENTATION AND QUANTITATIVE ANALYSIS OF THIN-LAYER CHROMATOGRAMS
F. W. Hefendehl 16 Sep. 1963 12 p refs Transl. into ENGLISH from Planta Med. v. 8, no. 1, 1960 p 65–70
(RSIC-53; AD-420091)

Various methods of producing permanent reprints of chromatograms and their quantitative analysis were examined. Experimental results show that chromatostrips can be made transparent by spraying with a one-to-one solution of paraffin in ether; thereafter the chromatograms can be copied by means of a photoprint procedure. The quantitative estimation of the components can be accomplished by means of an absorptiometric method used with the reprints. J.E.T.

N64-12234 Wolf Research and Development Corp., West Concord, Mass.
LONG LINE AZIMUTH DETERMINATION FROM RANGE AND OPTICAL MEASUREMENTS Scientific Report No. 1
Harry R. Kahler, Richard M. Moroney, and William T. Nixon May 1963 29 p refs
(Contract AF 19(628)-2379)
(AFCRL-63-740; AD-423025)

A solution is developed in vector form for determining the azimuth of long lines from timed simultaneous observations of range and direction to a target at altitude from the terminal points of the line. The solution is independent of the distance between the two points, and timing requirements are not at all severe. The 20-millesecond accuracy required for ballistic camera orientation is entirely adequate. A sample computation is included along with an error analysis, a FORTRAN program listing, and flow charts. Author

N64-12241 Wisconsin U., Madison Army Mathematics Res. Center

THE ZEROS OF A CERTAIN ENTIRE FUNCTION Technical Summary Report

M. L. Cartwright Aug. 1963 12 p refs

(Contract DA-11-022-ORD-2059)

(MRC-414; AD-424676)

Anselone and Bueckner, in considering the function $\Psi(z) = 1 - e^z - \int_{-1}^{1} e^{-zt}K(s)ds$, where $K \in L_1(-1,1)$, have shown that $\phi(t) = e^{zt}$ satisfies the differential-integral equation

$$\phi(t) - \phi(t+1) = \int_{-1}^{1} K(s)\phi(t-s)ds, \quad 0 \leq t < \infty,$$

if, and only if, z is a zero of $\Psi(z)$. They showed that $\Psi(z)$ had one and only one zero of $F(z) = 1 - e^z$ for the case when $r = |z|$ is large and had only a finite number of zeros for which $x \geq -\Delta$ ($z = x + iy$) for each fixed Δ. Further they conjectured that the number of zeros of $\Psi(z)$ other than those near the zeros of $F(z)$ is finite if and only if $K(s) = 0$ for $0 \leq s \leq 1$ except in a set of measure zero. This report establishes the truth of this conjecture and presents some further results about the zeros of $\Psi(z)$. I.v.L.

N64-12292 Wolf Research and Development Corp., West Concord, Mass.

MULTI-ANGULATION MULTI-LATERATION PROGRAMMING REPORT Scientific Report No. 2, Sep. 1963

Richard M. Moroney, Isabel M. Hussey, and William T. Nixon [1963] 109 p

(Contract AF 19(628)-2379)

(Rept. 63-2379-5; AFCRL-63-741; AD-423505)

Given nominal locations of a set of observation stations—simultaneously observed values of unit vectors from these stations to a so-called "flare point" and/or simultaneously observed values of the range to a number of so-called "range points"; a nominal value for the speed of light standard deviations for all measurement errors; station location errors and errors in the speed of light; the program determines corrected locations of the observation stations, location of all flare points and range points, suggested shifts in all datums, a correction to the speed of light, a calculated value for the bias in the range observations and standard deviations for the errors in the above outputs. Author

N64-12303 System Development Corp., Santa Monica

TWO THEOREMS ABOUT REGULAR BASES OF SETS OF WORDS Scientific Report 5

Seymour Ginsburg and Thomas N. Hibbard 4 Sep. 1963 28 p refs

(Contract AF 19(628)-485)

(SDC-TM-738/004/00; AFCRL-63-507)

A family of sets of words is said to be regularly independent if no member of the family is obtained from the remaining by U, ., and *. A family B of sets is said to be a generator of a family F if F is the smallest family containing B which is closed under U, ., and *. B is said to be a regular basis of F, if B is regularly independent and generates F. The following two results are proved: (1) Each regular set in each regular basis of a family F is in every generator of F. (2) If F is a family with a finite regular basis, then either F has just one regular basis and that contains just one set, or else the intersection of all regular bases contains at least two sets. Author

N64-12325 Cook Electric Co., Dayton, Ohio Inland Testing Labs.

AKLALINE BATTERY EVALUATION [Fifth Semi-annual and Final Report, 30 Jun. 1960-28 Feb. 1963]

W. W. Clark, W. G. Ingling, I. F. Luke, and R. Leaf Wright-Patterson AFB, Ohio. AF Aero Propulsion Lab., Apr. 1963 266 p refs

(Contract AF 33(616)-7529 and AF 33(657)-8450)

(ASD-TDR-63-394; AD-411245; supersedes ASD-TDR-62-893, -553, and -68, ASD-TDR-61-236) OTS: $4.60

This program, to date, includes the cycle-life performance evaluation and failure analysis of the following types of sealed, secondary, alkaline cells: one type of 12-amp-hr nickel-cadmium cell, and two types of 20-amp-hr nickel-cadmium cells, two types of 15-amp-hr silver-cadmium cells; and two types of 25-amp-hr silver-zinc cells. The results of cycle-life tests on the 12-amp-hr nickel-cadmium cells show that: (1) cell cycle-life with shallow discharges is considerably longer than cycle-life at deep discharges, and (2) cycle-life is reduced by high and low ambient temperature. The results of cycle-life tests on silver-oxide type cells, based upon the limited data from the incomplete tests, indicate the same general relation regarding cycle life with depth of discharge and temperature. Also, the silver-cadmium cells evaluated have a greater cycle life than the silver-zinc cells evaluated under corresponding test conditions. Author

N64-12326 Northwestern Technological Inst., Evanston, Ill.

ON A THEOREM OF FOULIS

Adi Ben-Israel Sep. 1963 4 p refs

(Contract Nonr-1228(10))

(ONR-RM-83; AD-260736)

The Foulis theorem applied to square matrices states that the generalized inverse of the matrix product AB is

$$(AB)^+ = P_{R(B^*A^*)}B^+P_{R(B)\cap}{}^{R(A^*)}A^+P_{R(AB)}.$$

In the present paper Foulis's theorem is extended to apply to rectangular matrices. R.T.K.

N64-12327 Northwestern Technological Inst., Evanston, Ill.

ON DIRECT SUM DECOMPOSITIONS OF HESTENES ALGEBRAS

Adi-Ben-Israel Aug. 1963 8 p refs

(Contract Nonr-1228(10))

(ONR-RM-82; AD-259837)

Suitable regularity conditions are invoked, rather than minimum polynomials, to characterize the elements of a $*$-linear Hestenes algebra A which have $*$-reciprocals (the $*$-reciprocal A' exists if and only if A is R-regular). The $*$-reciprocal is related to certain direct sum decompositions of A, which are of independent interest. I.v.L.

N64-12329 Wisconsin U., Madison

DIFFERENCE SETS IN ELEMENTARY ABELIAN GROUPS Technical Summary Report

H. B. Mann Sep. 1963 20 p refs

(Contract DA-11-022-ORD-2059)

(MRC-422; AD-424685)

This paper considers difference sets in elementary Abelian groups of order p^m, $m>1$. For $p = 2$ nontrivial difference sets with $u \leq \frac{v}{2}$ exist only for $v = 2^{2m}$, $k = 2^{2m-1} - 2^{m-1}$, $\lambda = 2^{2m-2} - 2^{m-1}$. For odd values of p the quadratic residues new necessary condition for the existence of difference sets in elementary p groups is derived. An enumeration of all parameter combinations with $v = p^m \leq 2500, m > 1$ leaves only nine cases undecided. Author

N64-12331 Wisconsin U., Madison
APPLICATIONS OF THE CALCULUS FOR FACTORIAL ARRANGEMENTS III: TWO WAY ELIMINATION OF HETEROGENEITY Technical Summary Report
M. Zelen and W. Federer Sep. 1963 31 p refs
(Contract DA-11-022-ORD-2059)
(MRC-410; AD-424678)

This paper considers general methods for the analysis and construction of designs having two-way elimination of heterogeneity. The general methods of analysis allow for incomplete row balance as well as incomplete blocks (columns) with respect to the treatments. The designs considered in this paper have the characteristic that both the block (column) and row incidence matrices are of the form

$$NN' = h(0,0)\, I_1 \times I_2 + h(0,1)\, I_1 \times J_2 + h(1,1) J_1 \times J_2$$

where the h quantities are constants, I_s is the identity matrix of order m_s, J_s is the $m_s \times m_s$ matrix with all unity elements, and x denotes the direct (or Kronecker) product. The new designs are constructed by taking the direct product of the row and column incidence matrices of two designs. Author

N64-12333 Wisconsin U., Madison
ON CERTAIN SERIES INVOLVING THE EIGENVALUES OF A STURM-LIOUVILLE OPERATOR Technical Summary Report
Richard C. Gilbert and Vernon A. Kramer Aug. 1963 51 p refs
(Contract DA-11-022-ORD-2059; NSF Grant 17824)
(MRC-417; AD-424996)

A direct method which avoids the use of Dikii's regularized sums of eigenvalues is presented for obtaining trace formulas for powers of a Sturm–Liouville operator. The method is applied in particular to the first and second powers. Author

N64-12353 Oslo U., Blindern (Norway) Inst. for Theoret. Phys.
ON THE INVERSION OF EIGENVALUE PROBLEMS
Egil A. Hylleraas Wright-Patterson AFB, Ohio, Aeron. Res. Labs., Nov. 1963 21 p refs Repr. from Phys. Mat.
(NASA Grant NsG-275-62)
Its Rept. 20; ARL-63-217

An attempt was made to draw attention to the inverse scattering problem in quantum mechanics and to add some generalizations and explanations. Several inconveniences and some weak points of current theories are pointed out. Consideration was given to single and binary systems of orthonormal functions, wave equation definitions and notations, inclusion of potentials with bound states, application to elementary potentials, alternative use of the binary system, comparison with other theories, and remark on completeness relation proofs. C.L.W.

21 METEOROLOGY

Includes climatology; weather forecasting; and lower atmosphere studies. *For related information see*: 05 Astronomy and Astrophysics; 12 Geophysics; and 29 Space Sciences.

N64-11446 Intermountain Weather, Inc., Salt Lake City, Utah
A STUDY OF THE PHYSICAL, THERMODYNAMICAL, AND DYNAMICAL CAUSES OF LOW CEILINGS AND VISIBILITIES Final Report
J. Vern Hales, Wilford Zdunkowski, and Donald Henderson Jun. 1963 95 p refs
(Contract AF 19(604)-7333)
(AFCRL-63-865; AD-423535)

Advective rates of change in meteorological quantities are estimated using a numerical technique for calculating gradients of the advected properties. An approximate method is presented to determine the time and height at which the air is cooled sufficiently to reach the dew point profile—presumably the time and height of the onset of fog formation. The solution is based on Brooks (1950), whose infrared radiation tables have been extended, and Jaeger's analytical solutions of the diffusion equations. The solution requires the Whittaker function, for which properties and routine evaluation are discussed. Three computer programs are given. Author

N64-11452 Bendix Corp., Baltimore, Md.
METEOROLOGICAL TRACKING RADAR STUDY Final Report
G. R. Hetrick 31 Oct. 1963 122 p refs
(Contract AF 19(628)-2499)
(AFCRL-63-766; AD-423612)

The purpose of the contract is to investigate the technical and economic suitability and availability of the existing tracking radars for use with the Robin and Rose Meteorological Balloon targets. The investigation is concentrated on the more stringent requirements of the Robin balloon. The study presents a discussion of the problem, the analysis of system errors, and examination of existing radars. It is recommended that a relatively inexpensive radar consisting of the Prelort Pedestal and Servo System be used in conjunction with specially tailored transmitter and receiver subsystems for a network of high-altitude research and data-gathering centers. The report suggests modifications to the Prelort radar and to the balloon. An examination of the present Robin tracking technique is also discussed. Author

N64-11601 Chicago U., Ill. Weather Forecasting Research Center
STUDIES IN WEATHER ANALYSIS AND FORECASTING Final Report [25 Feb.] 1960-[30 Sep.] 1963
Sverre Petterssen, ed. Sep. 1963 644 p refs
(Contract AF 19(604)-7230)
(AFCRL-63-718; AD-422337)

CONTENTS:

1. HEAT EXCHANGE AND CYCLONE DEVELOPMENT ON THE NORTH ATLANTIC OCEAN S. Petterssen, D. L. Bradbury, and K. Pedersen P A1–A76 refs (See N64-11602 03-21)
2. AN EXPERIMENT IN COMPUTATION OF PRECIPITATION K. Pedersen P B1–B11 refs (See N64-11603 03-21)
3. ON THE VERTICAL CIRCULATION PRODUCED BY RELEASE OF LATENT HEAT IN A STATIC AND QUASI-GEOSTROPHIC ATMOSPHERE K. Pedersen P C1–C12 refs (See N64-11604 03-21)
4. ON THE INFLUENCE OF RELEASED LATENT HEAT ON CYCLONE DEVELOPMENT M. B. Danard P D1–D5 refs (See N63-17998 16-21)
5. A NOTE ON THE USE OF SEA-SURFACE TEMPERATURES IN SYNOPTIC WEATHER ANALYSES D. L. Bradbury P E1–E13 refs (See N62-10630 03-12)
6. AN INVESTIGATION OF COLORADO CYCLONES W. L. Schallert P F1–F68 refs (See N62-13856 11-21)
7. A MODIFIED "SIGMA" SYSTEM OF COORDINATES W. E. Sangster P G1–G70 refs (See N64-11605 03-21)

8. AN INVESTIGATION OF THE STRUCTURE OF CLOUD AND WEATHER SYSTEMS ASSOCIATED WITH CYCLONES IN THE UNITED STATES S. Petterssen, ed., D. L. Bradbury, E. P. Mc Clain, Y. Omoto, G. V. Rao et al P H1–H126 refs (See N64-11181 02-21)

9. AN INVESTIGATION OF PRE-FRONTAL PRECIPITATION ZONES Y. Omoto P 11–180 refs (See N64-11182 02-21)

10. A CONTRIBUTION TO THE CLIMATOLOGY OF THE ARCTIC STRATOSPHERE E. P. Mc Clain P J1–J32 refs (See N64-11606 03-21)

11. ON THE PLACEMENT OF THE TROPOPAUSE IN THE ANTARCTIC R. Overby P K1–K44 refs (See N63-12148 05-12)

N64-11602 Chicago U., Ill. Weather Forecasting Research Center

HEAT EXCHANGE AND CYCLONE DEVELOPMENT OF THE NORTH ATLANTIC OCEAN

Sverre Petterssen, Dorothy L. Bradbury, and Kaare Pedersen *In its* Studies in Weather Analysis and Forecasting Sep. 1963 pA1–A76 refs (See N64-11601 03-21)

Results obtained from a general survey of the relation between the exchanges of heat and moisture at the ocean-atmosphere interface and the development of extratropical cyclones indicated: (1) essential differences between cyclogeneses on the North Atlantic Ocean and on th North American Continent; (2) that the effects of heat and cold sources on the field of motion associated with cyclone development are so large that adiabatic predictions of sea-level conditions can be of little value; (3) that the eddy flux of sensible heat from the ocean into the air is very large in the rear of cyclones in all stages of their development, whereas very little heat is supplied to, or given off by, the warm air; (4) that the rate of dissipation of kinetic energy within the atmosphere is negligible in comparison with that at the interface, and that this latter is much smaller than the eddy fluxes; and (5) that the radiative fluxes of heat from the ocean surface into the air are generally small, and the Laplacian of their fields is negligible in comparison with that of eddy fluxes. P.V.E.

N64-11603 Chicago U., Ill. Weather Forecasting Research Center

AN EXPERIMENT IN COMPUTATION OF PRECIPITATION

Kaare Pedersen *In its* Studies in Weather Analysis and Forecasting Sep. 1963 p B1–B11 refs (See N64-11601 03-21)

An experiment is discussed which was made to determine if accurate values of precipitation could be computed, when the mean vertical velocity through a column and the temperature and humidity at a representative level are known. Precipitation occurred in 30% of the places where no precipitation was predicted and failed to occur in 1% of the places where it was predicted. In general, the computed values of precipitation are 0 to small, and it was indicated that increasing the computed vertical motion by about 50% would tend to eliminate the discrepancy and increase substantially the correlation coefficients. P.V.E.

N64-11604 Chicago U., Ill. Weather Forecasting Research Center

ON THE VERTICAL CIRCULATION PRODUCED BY RELEASE OF LATENT HEAT IN A STATIC AND QUASI-GEOSTROPHIC ATMOSPHERE

Kaare Pederson *In its* Studies in Weather Analysis and Forecasting Sep. 1963 p C1–C12 refs (See N64-11601 03-21)

The hydrostatic and the quasi-geostrophic approximations are used to obtain a diagnostic equation for the vertical velocity, the resulting equation being linear. The velocity is divided into two parts, the first corresponding to dry adiabatic processes, and the second part representing the additional motion that can be ascribed to release of latent heat. The differential equation which describes this additional motion is hyperbolic within the region, corresponding to a conditionally stable atmosphere. By assuming that the horizontal scale of the area that experiences condensation is independent of pressure, the differential equation reduces to a one-dimensional one, and its solution is obtained by relaxation, even in the hyperbolic region. The vertical velocity is obtained also by an iterative procedure, leading to a converging infinite series in which each term is determined from an elliptic differential equation, and the two methods are found to yield the same results. Author

N64-11605 Chicago U., Ill. Weather Forecasting Research Center

A MODIFIED "SIGMA" SYSTEM OF COORDINATES

Wayne E. Sangster *In its* Studies in Weather Analysis and Forecasting Sep. 1963 p G1–G70 refs (See N64-11601 03-21)

A coordinate system is presented in which the lowest coordinate surface represents the topography of the earth's surface. Higher coordinate surfaces reflect this topography in diminishing degrees and become isobaric at and above the 500-mb level. Some basic equations of dynamic meteorology are derived in terms of this coordinate system. A numerical prediction scheme using the primitive equations of motion and this coordinate system is outlined. A method of representing the field of the horizontal pressure force in the non-isobaric coordinate surfaces, using geostrophic stream and potential functions, is described. This method is applied to a variety of synoptic situations, and the results are compared with the conventional sea-level charts. The charts of the geostrophic stream and potential functions appear to give a more accurate representation of the geostrophic wind field than do the sea-level charts. Author

N64-11606 Chicago U., Ill. Weather Forecasting Research Center

A CONTRIBUTION TO THE CLIMATOLOGY OF THE ARCTIC STRATOSPHERE

E. Paul Mc Clain *In its* Studies in Weather Analysis and Forecasting Sep. 1963 p J1–J32 refs (See N64-11601 03-21)

A previous study of January temperatures in the mid-stratosphere at several arctic stations near 80° W has been extended to include other stations in the North American, European, and Asiatic sectors of the Arctic, and to the remaining two months of the winter season. Distinctly bimodal temperature frequency distributions are evidently confined to the general area of the Canadian Archipelago and northern Greenland, being characteristic of this region throughout the winter. Mean 25-mb charts and mean cross sections are used to illustrate the two quite dissimilar thermal and circulation regimes that tend to dominate the arctic stratosphere for long periods during the polar night. Author

N64-11721* National Engineering Science Co., Houston, Tex.

A POSSIBLE OSCILLATION OF THE WINDS IN THE EQUATORIAL STRATOSPHERE WITH A PERIOD OF 24 TO 27 MONTHS, APPENDIX 2

John C. Freeman, Jr. *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 2-1–2-15 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf

An analytical model of the equatorial winds, in which alternating easterlies and westerlies are possible, is presented. The model is very dependent on the equatorial environment, and as a bonus the period of the oscillation between easterlies and westerlies is of the right order of magnitude. A very stable, and therefore nearly flat, layer of the atmosphere at the equator is postulated. This stability is important as a restoring factor. I.v.L.

N64-11722* National Engineering Science Co., Houston, Tex.
A POSSIBLE INTERTIAL OSCILLATION OF THE EQUATORIAL STRATOSPHERE, APPENDIX 3
John C. Freemen, Jr. *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 3-1-3-7 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf

An analytical model depicting inertial oscillation of the equatorial stratosphere is presented. The model represents an oscillating boundary with a constant wind speed and thus allows alternate east and west winds as the boundary moves from, and to, the equator. Ebdon and Veryard (1961) make a point that the long-term east and west changes in the wind have some brief breaks in them. This report shows that there is a much shorter vibration of the same type possible and that it is probably a mechanism for a two- to fifteen-day lag in the response of the tropospheric circulation to solar and geomagnetic disturbances. I.v.L.

N64-11723* National Engineering Science Co., Houston, Tex.
A THEORY FOR ATMOSPHERIC CROSS SECTIONS, APPENDIX 4
John C. Freeman, Jr. *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 4-1-4-41 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf

The flow in the upper troposphere is described. It is postulated that the upper troposphere acts in accord with two very basic principles—the conservation of vorticity and the thermal wind approximation—which permit explanation of the gross features. The concept developed shows: (1) A concentration of isentropes and isotachs results as a natural process of the atmosphere responding to the vorticity conservation and the thermal wind relationship, when a disturbance in the initial flow arises from an outside cause. (2) The process in (1), on cross sections, can continue until a complete discontinuity is obtained in the isentropic and isotachic fields. This discontinuity appears in the middle of a region of increasing anticyclonic vorticity in accord with the vorticity conservation law. I.v.L.

N64-11724* National Engineering Science Co., Houston, Tex.
SELECTION OF KEY DAYS, APPENDIX 5
Leon F. Graves *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 5-1 - 5-7 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf.

An arbitrary method of selecting what seemed to be a reasonable "break" in the ΔC_p (the daily planetary character figure) distribution for the period July to September 30, 1961, is described. This method resulted in the arriving at a single key day for predicting variations in pressure systems, August 29. There were no changes of 0.6 in the daily C_p. Dropping the limit to 0.5 would have added six dates to the two and one-half month C_p period under consideration. I.v.L.

N64-11726* National Engineering Science Co., Houston, Tex.
A MODEL OF EQUATORIAL FLOW, APPENDIX 7
John C. Freeman, Jr. *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 7-1-7-17 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf

The motion of bands of fluids with constant vorticity has always lagged behind wave motions in a constant flow as a technique for studying fluid flow. This report applies this technique to the flow in the tropics. A band of fluid is considered that reaches from the latitudes to the equator. All latitudes considered have the same absolute vorticity, namely, that of the earth at some latitude y_o, with the coriolis parameter f_o and with no cross flow across y_o. I.v.L.

N64-11744 Aracon Geophysics Co., Concord, Mass.
SYNOPTIC INTERPRETATIONS OF CLOUD VORTEX PATTERNS AS OBSERVED BY METEOROLOGICAL SATELLITES Final Report
Roland J. Boucher, Clinton J. Bowley, Earl S. Merritt, C. W. C. Rogers, and Paul E. Sherr Nov. 1963 213 p refs
(Contract Cwb-10630)
(ARA-F-8243-2)

Correlations between the cloud features in vortex patterns and conventional synoptic parameters were examined. For vortices normally representative of the more advanced stages of development, the one standard deviation circle, for the distance between the position of the cloud vortex center and that of the related surface pressure center, had a radius of 148 nautical miles. At 500 mb, the corresponding value was 109 nautical miles. In both cases, it appears that a considerable part of this position difference may often be ascribable to uncertainty as to the true position of the pressure center. In general, intermediate stage vortices were better related to surface pressure center positions; in advanced stages, the relation to the 500-mb center is improved. Smaller vortices in the flow to the rear of major systems were found to be related to small amplitude troughs and were often precursors of the formation of significant weather systems. Tropical vortices were found to originate frequently in major intense cloud bands, with subsequent system intensity identifiable first from the geometric pattern of the cumuliform bands, and later from the appearance and extent of the cirriform canopy. Author

N64-11836 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM TRUDY GLAVNOY GEOFIZICHESKOY OBSERVATORII IMENI A. I. VOYEYKOVA [LENINGRAD] (REPORT OF THE MAIN GEOPHYSICAL OBSERVATORY IMENI A. I. VOYEYKOV), NO. 126, 1962
G. M. Bashkirova et al 15 Apr. 1963 144 p refs Transl. into ENGLISH of 12 articles p 3-89
(JPRS-18696; OTS-63-21573) OTS: $2.75

CONTENTS:

1. WINTER PRECIPITATIONS INDUCED BY ITALIAN ANTIHAIL ROCKETS G. M. Bashkirova, M. A. Khimach, V. T. Shvarts, and N. S. Shishkin p 1-7 ref (See N64-11837 03-21)

2. USE OF HYGROSCOPIC SALTS IN ANTIHAIL ROCKETS V. Ya. Nikandrov p 8-10 refs (See N64-11838 03-21)

3. A METHOD FOR THE USE OF AQUEOUS SOLUTIONS OF LEAD IODIDE AS AGENTS IN SUPERCOOLED CLOUDS AND FOGS Ye. V. Bakulina, T. N. Gromova, and P. N. Krasikov p 11-19 refs

4. EXPERIMENTS CONCERNING THE INTERACTION OF AQUEOUS SOLUTION OF LEAD IODIDE ON SUPERCOOLED CLOUDS T. N. Gromova, P. N. Krasikov, V. T. Lenshin, G. T. Nikandrova, M. A. Khimach et al p 20–28 refs (See N64-11840 03-21)

5. SOLID FUEL TORCHES AS MEANS FOR INTRODUCING CRYSTALLIZATION NUCLEI IN FOGS NEAR THE GROUND V. Ya. Nikandrov p 29–33 (See N64-11841 03-21)

6. HAIL FORECASTING N. S. Shishkin p 34–48 refs (See N64-11842 03-21)

7. FORECAST OF THE AMOUNT OF AIR-MASS SHOWER PRECIPITATION V. T. Lenshin, G. I. Osipova, and N. S. Shishkin p 49–60 refs (See N64-11843 03-21)

8. SOME RESULTS OF THE ANALYSIS OF NETWORK OBSERVATION OF CLOUDS AND PRECIPITATIONS IN THE LAKE SEVAN MOUNTAIN BASIN A. P. Chuvayev, and G. I. Osipova p 61–85 refs (See N64-11844 03-21)

9. CONNECTION AMONG PRECIPITATIONS IN VARIOUS REGIONS OF THE LAKE SEVAN BASIN V. T. Lenshin, G. I. Osipova, and A. P. Chuvayev p 86–93 ref (See N64-11845 03-21)

10. CALCULATION OF THE BASE HEIGHT OF LOW STRATIFORM CLOUDS V. S. Kozharin p 94–107 refs (See N64-11846 03-21)

11. ALTITUDE VARIATIONS OF MICROSTRUCTURE IN CLOUDS OF VARIOUS TYPES G. T. Nikandrova p 108–121 refs

12. SOME PECULIARITIES IN THE PATTERN OF SUMMER PRECIPITATIONS ON THE LEEWARD SLOPES OF MOUNTAINS IN ARID ZONES OF ARMENIA A. P. Chuvayev p 122–140 refs (See N64-11847 03-21)

N64-11837 Joint Publications Research Service, Washington, D.C.

WINTER PRECIPITATIONS INDUCED BY ITALIAN ANTI-HAIL ROCKETS

G. M. Bashkirova, M. A. Khimach, V. T. Shvarts, and N. S. Shishkin *In its* Transl. from Tr. G1. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 1–7 ref (See N64-11836 03-21) OTS: $2.75

Thermal conditions have been indicated at which the sublimated AgI crystallizes the supercooled clouds, following the cheddite explosion of the rocket head. Author

N64-11838 Joint Publications Research Service, Washington, D.C.

USE OF HYGROSCOPIC SALTS IN ANTIHAIL ROCKETS

V. Ya. Nikandrov *In its* Transl. from Tr. G1. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 8–10 refs (See N64-11836 03-21) OTS: $2.75

The results of the laboratory investigations of hygroscopic salts from the Italian antihail rocket have been presented. It has been shown that their use leads to the stabilization of fog. Author

N64-11839 Joint Publications Research Service, Washington, D.C.

A METHOD FOR THE USE OF AQUEOUS SOLUTIONS OF LEAD IODIDE AS AGENTS IN SUPERCOOLED CLOUDS AND FOGS

Ye. V. Bakulina, T. N. Gromova, and P. N. Krasikov *In its* Transl. from Tr. Gl. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 11–19 refs (See N64-11836 03-21) OTS: $2.75

The authors show, on the basis of the laboratory data, that supercooled clouds may be influenced by aqueous solutions of lead iodide. They describe a method for producing large volumes of $Pb(NO_3)_2$ and NH_4I. Author

N64-11840 Joint Publications Research Service, Washington, D.C.

EXPERIMENTS CONCERNING THE INTERACTION OF AQUEOUS SOLUTION OF LEAD IODIDE ON SUPERCOOLED CLOUDS

T. N. Gromova, P. N. Krasikov, V. T. Lenshin, G. T. Nikandrova, M. A. Khimach, et al *In its* Transl. from Tr. Gl. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 20–28 refs (See N64-11836 03-21) OTS: $2.75

The results of experimental investigations concerning the interaction of aqueous solution of lead iodide on supercooled clouds to induce precipitation and disperse the clouds are presented. When lead iodide solutions were sprayed on cumulus clouds thicker than 2 km, at temperatures below −7° C, precipitation was induced. At temperatures below −15° C, 200- to 460-m-thick stratocumulus cloudiness could be dispersed by spraying the clouds with PbI_2 solutions. R.T.K.

N64-11841 Joint Publications Research Service, Washington, D.C.

SOLID FUEL TORCHES AS MEANS FOR INTRODUCING CRYSTALLIZATION NUCLEI IN FOGS NEAR THE GROUND

V. Ya. Nikendrov *In its* Transl. from Tr. G1. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 29–33 (See N64-11836 03-21) OTS: $2.75

Solid torches with fuel containing an admixture of AgI were used to disperse supercooled fogs. This method permits a harmless introduction of silver iodide and other ice-inducing agents into fog at ground level. A description of the torch design and the manner in which it is used is given. R.T.K.

N64-11842 Joint Publications Research Service, Washington, D.C.

HAIL FORECASTING

N. S. Shishkin *In its* Transl. from Tr. G1. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 34–48 refs (See N64-11836 03-21) OTS: $2.75

The layer method for hail forecasting is described along with an appropriate experimental verification conducted in the Alazan valley (Eastern Georgia) during the summer of 1960. Author

N64-11843 Joint Publications Research Service, Washington, D.C.

FORECAST OF THE AMOUNT OF AIR-MASS SHOWER PRECIPITATION

V. T. Lenshin, G. I. Osipova, and N. S. Shishkin *In its* Transl. from Tr. G1. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 49–60 refs (See N64-11836 03-21) OTS: $2.75

A procedure for forecasting the quantity of air-mass shower precipitations based on the layer method has been described, along with the results of experimental tests in the steppe regions of the Ukrainian S.S.R. Author

N64-11844 Joint Publications Research Service, Washington, D.C.

SOME RESULTS OF THE ANALYSIS OF NETWORK OBSERVATION OF CLOUDS AND PRECIPITATIONS IN THE LAKE SEVAN MOUNTAIN BASIN

A. P. Chuvayev and G. I. Osipova *In its* Transl. from Tr. G1. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 51–84 refs (See N64-11836 03-21) OTS: $2.75

The paper discusses the connection between the yearly course of precipitations and the yearly course of the probability of partially clear and overcast skies, according to the observation of the general cloudiness of the region under study. It discusses also the daily course of the probability of partially clear and overcast skies with low clouds, as well as the diurnal course of the recurrence of precipitations at the station Kamo (former Nor-Bayazet). The conclusions may serve as a starting point for the estimate of climatic resources for the artificial increase of precipitation in the water-collecting area of Lake Sevan. Author

N64-11845 Joint Publications Research Service, Washington, D.C.

CONNECTION AMONG PRECIPITATIONS IN VARIOUS REGIONS OF THE LAKE SEVAN BASIN

V. T. Lenshin, G. I. Osipova, and A. P. Chuvayev *In its* Transl. from Tr. G1. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 86–93 refs (See N64-11836 03-21) OTS: $2.75

The paper investigates characteristics of precipitation at various stations and regions of the Lake Sevan basin during various months and periods of the warm half of the year. This leads to the choice of stations most appropriate for application and evaluation of the artificial increase of precipitation. Author

N64-11846 Joint Publications Research Service, Washington, D.C.

CALCULATION OF THE BASE HEIGHT OF LOW STRATIFORM CLOUDS

V. S. Kozharin *In its* Transl. from Tr. G1. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 94–107 refs (See N64-11836 03-21) OTS: $2.75

The altitude distribution of the steady-state humidity in the lower layer of the atmosphere is presented as a function of the thermodynamic constitution of that layer. Equations are derived for the calculation of the height of the condensation level (lower boundary of the clouds). Equations for the base of the clouds were tested using the airplane probing data. Best results are achieved under the assumption that the relative humidity is 100% at the cloud base level. Author

N64-11847 Joint Publications Research Service, Washington, D.C.

SOME PECULIARITIES IN THE PATTERN OF SUMMER PRECIPITATIONS ON THE LEEWARD SLOPES OF MOUNTAINS IN ARID ZONES OF ARMENIA

A. P. Chuvayev *In its* Transl. from Tr. G1. Geofizicheskoy Observ. im. A. I. Voyeykova [Leningr.] no. 126, 1962 15 Apr. 1963 p 122–140 refs (See N64-11836 03-21) OTS: $2.75

It has been proven from the analysis of average monthly total precipitation at stations located in the windward and leeward slopes of the Gegam (Agman) range and the Aregats mountains that during the driest summer months when the condensation level is close to the upper peaks of the tallest mountains the amount of precipitation is larger on the leeward than on the windward slopes. Author

N64-11943 Weather Bureau, Asheville, N.C.

CLIMATOLOGY OF THE UPPER AIR AS RELATED TO THE DESIGN AND OPERATION OF SUPERSONIC AIRCRAFT

Harold L. Crutcher Mar. 1963 79 p refs Presented at the 6th Ann. Symp. of the Soc. of Exptl. Test Pilots, Beverly Hills, Calif., 28–29 Sep. 1962 Submitted for Publication GPO: $0.50

A comprehensive climatology of the lower stratosphere (50,000 to 100,000 ft) must be obtained and presented to aircraft engineers for aid in developmental studies, to operational planners for aid in organizing and scheduling within the industry, and to forecasters as an aid in the daily task of providing weather information. Important elements are temperatures, pressures, densities, winds (shears and turbulence), momentum, hydrometers, water vapor, clouds, precipitations, dust, ions and ozone, and electricity. Wherever sufficient information is available some ideas as to the statistical distribution of the elements are given. The work presented is based on available weather records and research by many investigators. In some cases, theoretical considerations are employed to extract information from the data. In most cases, though, the presentation is of processed and analyzed weather information. Author

N64-11945 Geophysics Corp. of America, Bedford, Mass.

VORTEX CLOUD STUDIES Final Report

Wen Tang Apr. 1963 126 p refs

(Contract Cwb-10316)

(GCA-TR-63-4-G)

Simple dynamical models are constructed to explain the formation of spiral cloud bands in hurricanes and cyclones. In Model I, instability due to a vertical wind shear perpendicular to the mean flow is stressed. This model leads to small or medium scale disturbances; the preferred scale for the spiral cloud bands in hurricanes is computed to be about 25 to 30 km for the assumed atmospheric parameters. Model II includes the effect of rotation and friction on the instability due to a thermal stratification, and a wind shear parallel to the mean wind direction. In Model III, the effect of baroclinicity is also considered. The preferred wavelengths for a statically stable atmosphere are much larger than in the Models I and II. The numerical computations for a set of assumed parameters indicate that the preferred wavelength can reach 200 to 300 km, which is comparable to cloud band spacings observed by meteorological satellites. Author

N64-11963 Hazelton-Nuclear Science Corp., Palo Alto, Calif.

RADIOACTIVE FALLOUT IN CONVECTIVE SHOWER PRECIPITATION Progress Report

Paul Kruger, D. Ray Booker, Larry G. Davis, and Charles L. Hosier 30 Jun. 1963 49 p refs

(Contract AT(04-3)-457)

(HNS-24)

During 1962, three collections of precipitation from convective storms were made. The data confirm the observations made earlier in relating the peak Sr^{90} concentration in developing cells to the maximum height of the cloud tops, relative to the height of the tropopause and the distance from the cells to the jet stream. The peak concentrations in the 1962 collections were about a factor of forty greater than those in 1961. The effects of the relative distance of the cell centers with respect to the collection site and the effects of evaporation below the cloud bases also were noted. Cells whose centers pass directly over the collection site show marked Sr^{90} concentration increases associated with downdrafts and cell development, and cells whose peripheries pass over the collection site show

Sr^{90} concentration decreases initially due to lessening evaporation effects followed by increases due to further cell development. Author

N64-11998* National Aeronautics and Space Administration, Washington, D.C.
METEOROLOGICAL SATELLITES AND WEATHER RECONNAISSANCE AIRCRAFT– COMPLEMENTARY OBSERVING SYSTEMS
William K. Widger, Jr. Repr. from Bull. of the Am. Meterol. Soc., v. 4 no. 9, Sep. 1963 p 549–563 refs Presented at the Symp. on the Collection of Meteorol. Data from Aircraft 197th Natl. Meeting, Am. Meteorol. Soc., Tallahassee, Fla.

The relative observational capabilities of aircraft weather-reconnaissance techniques and meteorological staellites for obtaining meteorological data were obtained for the following parameters: (1) the extent of the area observed and its contiguous character; (2) frequency of observation; (3) cloud-cover (4) altitude of cloud bases and tops; (5) cloud type; (6) microphysical parameters—cloud physics, aerosol, and particulate matter in general; (7) pressure measurements; (8) winds; (9) radiation parameters; (10) temperature; (11) humidity; (12) ozone; (13) precipitation; (14) turbulence; and (15) surface conditions. The results of the comparison demonstrate that the satellite and the aircraft have their own strengths and limitations; together, they provide a complementary capability for obtaining data of significance for both operational and research purposes. R.T.K.

N64-12007 Joint Publications Research Service, Washington, D.C.
PLANS AND MEETINGS OF SOVIET METEOROLOGICAL AND HYDROLOGICAL ORGANIZATIONS
19 Dec. 1963 14 p Transl. into ENGLISH of 4 articles from Meteorol. i Gidrol. (Moscow), no. 11, 1963 p 62–64
(JPRS-22378; OTS-64-21070) OTS: $0.50

CONTENTS:
1. HYDROMETEOROLOGICAL SERVICE LAYS PLANS FOR WORK DURING THE INTERNATIONAL YEAR OF THE QUIET SUN p 1–2
2. ACTIVITIES OF CERTAIN INSTITUTIONS OF THE HYDROMETEOROLOGICAL SERVICE OF THE USSR p 3–5
3. RECENT MEETINGS OF SOVIET METEOROLOGICAL AND HYDROLOGICAL ORGANIZATIONS p 6–9
4. SOVIET METEOROLOGISTS ATTEND ASSEMBLY OF INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS p 10–11

N64-12060 Aerospace Corp., El Segundo, Calif. Plasma Research Lab.
AC STABILIZED THETA-PINCH
S. L. Leonard and M. H. Dazey 15 Nov. 1963 34 p refs
(Contract AF 04(695)-169)
(TDR-169(3210-02)TR-1; SSD-TDR-63-219; AD-424050)

An attempt has been made to demonstrate the dynamic ac stabilization of the magnetic confinement of a plasma column in a theta-pinch apparatus capable of producing 250 ka. The stabilizing current was produced by the damped oscillating discharge of a specially fabricated 115-kv capacitor. No stabilizing effect was observed. A second theta-pinch apparatus capable of producing currents of up to 400 ka has been used in further experiments. The dynamic behavior of the plasma produced in this device has been studied with the aid of streak photography, Kerr-cell photographs, and high-speed framing camera photographs. Spectroscopic studies of the plasma, including measurements of the ratio of the intensity of the D_β Balmer line to the intensity of the continuum, have yielded values for the electron temperature and electron (ion) density. Author

N64-12071 Aerospace Corp., El Segundo, Calif. Plasma Research Lab.
A VELOCITY-ELECTRICAL CONDUCTIVITY TRANSDUCER FOR AXISYMMETRIC RE-ENTRY VEHICLES
Allen E. Fuhs and O. L. Gibb 10 Oct. 1963 25 p refs
(Contract AF 04(695)-269)
(TDR-269(4810-20)-1; BSD-TDR-63-206; AD-424550)

A transducer for measuring the product of electrical conductivity and velocity and having a geometry particularly suitable for axisymmetric vehicles is described. The relation of plasma sheath properties to signal is investigated theoretically. It is the current within a narrow ring of the plasma sheath concentric with the sensing coil that causes the signal. An experiment was performed using an arc plasma jet. The aim of the experiment was to confirm the operation of the instrument. Author

N64-12109 National Academy of Sciences-National Research Council, Washington D.C. Geophysics Research Board
AN OUTLINE OF INTERNATIONAL PROGRAMS IN THE ATMOSPHERIC SCIENCES
Sverre Petterssen [Jan. 1963] 105 p refs
(NAS-NRC-Publ. 1085)

Programs are outlined reflecting recognition of the accomplishment possible in the exploration of the atmospheric sciences through the collaboration of hydrologists, oceanographers, and meteorologists and in the realization of rapid expansion in meteorology, with the tendency of meteorology to merge with eronomy and planetary physics. Included in the outline are objectives and general recommendations, research on weather prediction and modification, studies of the high atmosphere, atmospheric chemistry, climatology and related areas, education and training, meteorological services, and the relation of meteorology to hydrology and oceanography. C.L.W.

N64-12119 Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.
GALVESTON AREA (ARMS-II)
R. B. Guillou Oak Ridge, Tenn., AEC Div. of Tech. Inform., 15Jan. 1963 24p refs
(CEX-62.6.1) OTS: $1.25

The Aerial Radiological Measuring Survey (ARMS) of the Galveston area was part of a nationwide program to measure present environmental levels of gamma radiation. The data are presented as aeroradioactivity units, or areas with similar gamma radiation rates at 500 ft., at two map scales: (1) generalized at about 1:1,000,000 and (2) detailed at 1:250,000. The aeroradioactivity in the area is less than 800 counts/sec, and in much of the area, the radioactivity is less than 400 counts/sec. Most of the area has a low radioactivity, and the surficial materials are mostly Quaternary clays, silts, and sand, which are, in general, weakly radioactive. Author

N64-12141 Joint Publications Research Service, Washington, D.C.
MARINE SURVEYING AND OBSERVATIONS
Yu. A Volkov et al 10 Oct. 1963 23 p refs Transl. into ENGLISH of 3 articles from Okeanologiya (Moscow), v. 3, no. 4, 1963 p 706–714 and 750–752
(JPRS-21410; OTS-63-31918) OTS: $0.75

The following articles are included: (1) Certain Problems in the Method for Making Meteorological Observations in the Open Sea; (2) Magnetic Observations in the Pacific Ocean; and (3) Conference on Problems of Marine Magnetic Surveying. R.T.K.

N64-12244 Air Weather Service, Scott AFB, Ill.
COMPUTATION OF ATMOSPHERIC REFRACTIVITY ON THE USAF SKEW T, LOG P DIAGRAM
K. R. Johannessen Sep. 1963 11 p refs
(Tech. Rept. 169; AD-422637)

This report presents a grid for the USAF Skew T, Log P Diagram by means of which the atmospheric refractivity can be read directly from the traces of temperature and dew point as entered on the diagram. In this manner, the refractive index can be evaluated directly from the plotted sounding without the use of an external nomogram. The necessary high values can be entered. The accuracy and range of the computations should cover most applications of Air Weather Service detachments. I.v.L.

N64-12248 Army Electronics Research and Development Activity, Fort Huachuca, Ariz. Meteorology Research Div.
MODEL FOR WIND FLOW IN AN IDEALIZED VEGETATIVE CANOPY
R. M. Cionco, W. D. Ohmstede, and J. F. Appleby Jun. 1963 37 p refs
(ERDAA-MET-7-63; Meteorol. Res. Note 5; AD-422705)

This report presents the results of a study which examines the characteristic parameters of windflow in an idealized vegetative canopy. Equations characterizing the windflow in and above the vegetative canopy are derived and compared with data collected in and above various crops. Observations taken in a corn field indicate a marked similarity for the ideal canopy. Although the utility of the approach was not proven, the concept does seem to show promise. It is hoped this report will stimulate thought and investigation which will ultimately lead to the objective of expressing the aerodynamic roughness effects in terms of vegetative characteristics. Author

N64-12283 American Meteorological Society, Boston, Mass.
THE STRUCTURE OF THUNDERSTORM SHOWERS ACCORDING TO DATA ON THE INTENSITY DISTRIBUTION OF RADAR ECHOES WITH HEIGHT [STRUKTURA GROZOVYKH ZLYV ZA DANYMY PRO ROZPODYL INTENSIVNOSTI RADIOLUNY Z VYSOTOIU]
M. L. Markovich and V. M. Muchnik Aug. 1963 17 p refs
Transl. into ENGLISH of an article from Ukr. Fiz. Zh. (Kiev), v. 5, no. 2, 1960 p 259–269
(Contract AF 19(604)-6113)
(AD-421984)

An investigation was made of the physical nature of the change in the intensity of radar echoes with height during thundershowers. Direct measurements of the variation of echo intensity with height, as expressed by radar reflectivity, showed that the echo intensity changes considerably from the level of maximum reflectivity (somewhere within the cloud) to the ground. R.T.K.

N64-12335 Air Weather Service, Scott AFB, Ill.
A PRELIMINARY ANALYSIS OF MEAN WINDS TO 220,000 FEET
H. S. Appleman Oct. 1963 8 p refs
(AWS-TR-173; AD-422862)

Studies of meteorological-rocket wind measurements at altitudes between 150,000 and 200,000 feet are discussed, and the following conclusions for the area south of 39° N are indicated: (1) The wind regime between 150,000 and 225,000 feet is monsoonal in character, dominated by a long winter season of strong westerlies and a shorter season of not quite so strong easterlies which are separated by brief transitional periods of weak and variable winds; the meridional component is primarily southerly, is relatively weak in comparison to the zonal component, and evidences no marked altitude of seasonal trends. (2) The speed of both the winter westerlies and summer easterlies increases with altitude up to the 200,000-foot level (somewhat lower for the summer easterlies) then decreases. (3) The springtime shift from westerlies to easterlies begins above 200,000 feet, then progresses downward with a lag of about 2 to 3 weeks at 150,000 feet; the autumn reversal begins near 210,000 feet, then proceeds simultaneously upward and downward with a lag of perhaps 5 days at 220,000 feet to 2 to 3 weeks at 150,000 feet. P.V.E.

22 NAVIGATION AND GUIDANCE

Includes autopilots; star tracking; inertial platforms; and air traffic control. *For related information see*: 06 Auxiliary Systems; 08 Communications; 09 Electronics; 10 Facilities, Research and Support; 15 Instrumentation and Photography; 20 Mathematics; and 29 Space Sciences.

N64-11734 Autonetics, Anaheim, Calif.
AIRBORNE APPROACH AND LANDING SYSTEM STUDY Final Report
R. L. Doty 2 Aug. 1963 157 p refs
(NASA CR-52999; EM-0363-113) OTS: $11.50 ph, $4.91 mf

Three generalized system arrangements were considered. One system arrangement uses inertial information, one uses forward looking radar, and one uses omnidirectional Distance Measuring Equipment (DME). A survey was made of current "off-the-shelf" equipment which might be used to mechanize a system. Component operation and performance were reviewed and tabulated. Recommendations are made concerning the equipment required to implement a system. The recommended system includes a radar altimeter, FM/CW DME, digital computer, two-gyro platform, barometric altimeter and rate of climb indicator, accelerometer, and multiplexer. Procedures for manuevers other than those required for approach and landing, as well as flight test procedures, were investigated. Breadboard circuits were fabricated to confirm the applicability of circuit configurations investigated for generating the display. These circuits consisted primarily of the interface between the computer and the CRT display. Author

N64-11747 RAND Corp., Santa Monica, Calif.
TRAJECTORY AND ORBIT PLOTTER INSTRUCTION MANUAL
R. H. Frick, W. I. Rumer, and E. H. Sharkey Oct. 1963 233 p
(Contract AF 49(638)-700; Proj. RAND)
(R-418-PR; AD-422502)

This report describes a graphic method for obtaining the solution of a large class of trajectory and orbit problems. By this method it is possible, given a set of initial conditions, to construct the resulting trajectory or orbit and determine the velocity path angle, ground range, altitude, and time of

flight corresponding to any point of the path. In addition, it is also possible to take into account the effects of earth rotation on the ballistic path and to determine the latitude and longitude of points on the earth trace, including the impact position. The method should have considerable application to the class of problems not requiring the extreme precision of the high-speed digital computer. Author

N64-11816* Exotech Inc., Alexandria, Va.
ATTITUDE CONTROLS FOR SUN-ORIENTED SPACE STATIONS Summary Report
William C. Cooley, Samuel Schalkowsky, and Terrell Marshall, Jr. Nov. 1963 49 p
(NASA Contract NASw-720)
(NASA CR-55033; TR-006) OTS: $4.60 ph, $1.67 mf

This report summarizes the results of a study on the effect of launch parameters and choice of control criteria on the reaction control propellant requirements of an axisymmetric, rotating, manned space station. The study deals with attitude control of the station toward the sun, as influenced by secular gravity-gradient torques, and the annual motion of the earth around the sun. Analytical relationships are derived and the results of computer studies are presented. It is concluded that when reasonable misalignment angles are permitted and control is in an on-off manner, significant differences in propellant requirement will exist between the four quarters of any one year. It is also shown that the most practical approach to reaction jet actuation is by on-off control which will at certain times maintain the sun-pointing axis near the maximum permissible misalignment angle, in order to minimize the secular gravity-gradient torque. Author

N64-11892* Grumman Aircraft Engineering Corp., Bethpage, N.Y.
MOMENTUM CONTROL OF THE OAO SPACECRAFT UTILIZING THE EARTH'S MAGNETIC FIELD
Melvin Paiken and Ross Fleizig [1963] 44 p refs Presented at the 14th Intern. Astronautical Congr., Paris, 25 Sep.–1 Oct. 1963
(NASA Contract NAS5-814)
(IAC Paper 32)

In this advanced control technique, the momenta of inertia wheels, which provide the basic control torques, are regulated by torques created by the interaction of current-carrying coils with the earth's magnetic field. Operation of momenta control in this way permits an extremely accurate spacecraft pointing capability for long periods of time. Analytic methods are outlined for the determination of OAO attitude stability and pointing accuracy, as well as for the effectiveness of the momentum regulation technique. These methods permit closed-form solutions of the approximate, linearized equations of motion and analog simulations of the complete equations, including the significant nonlinear effects. Finally, the following results are presented and discussed: required component dynamic characteristics; comparison between jet and magnetic field momentum regulation effectiveness; and the effects on functional performance of component structural misalignment, induced field interference, operation under saturation conditions and alternative control inputs to the momentum regulation loop. Author

N64-11932 Colorado U., Boulder Lab. for Atmospheric and Space Physics
BIAXIAL POINTING CONTROL Final Report
Frederick C. Wilshusen Aug. 1963 33 p
(Contract AF 19(604)-6649)
(AFCRL-63-703; AD-422424) OTS: $3.60

Progress in the development of the Biaxial Pointing Control in both the azimuth and elevation servosystems is discussed. The pointing servo is a device designed for attachment to an Aerobee, or similar type rocket, to continually orient an instrument at the sun during a rocket flight. Infrared photoelectric sensors detect the angular error of pointing in elevation and in the cross-rotation or azimuth axes. This information is fed to the servosystem which, in turn, corrects the error. R.T.K.

N64-11993* National Aeronautics and Space Administration, Washington, D.C.
DESIGN AND EVALUATION OF A PREDICTOR FOR REMOTE CONTROL SYSTEMS OPERATING WITH SIGNAL TRANSMISSION DELAYS
John E. Arnold and Paul W. Braisted (Stanford U.) Dec. 1963 114 p refs
(NASA Grant NsG-111-61)
(NASA-TN-D-2229) OTS: $2.50

A series of tracking experiments was conducted with an experimental vehicle. An upper bound of tracking performance was established by driving without a signal transmission lag. A lower bound was established by driving with a signal transmission lag. The ability to drive with the predictor can be seen in relation to these upper and lower bounds. The results of the tracking experiments showed that the predictor makes it possible to drive nearly as well with a signal transmission lag, as to drive at the same speed without a signal transmission lag. In order to free the driver from having to follow a prepared line or track, a maze was used that involved open areas with a series of limited objectives in the form of gates, or wickets. The ability of the predictor to aid the human operator was determined. The results of the maze experiments showed that the predictor is not needed in open areas where no precise control is required but is needed in approaching and driving through congested areas. Author

N64-12102* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ON STUDIES IN THE FIELDS OF SPACE FLIGHT AND GUIDANCE THEORY Progress Report No. 4 [20 Dec. 1962–18 Jul. 1963]
W. E. Miner 19 Sep. 1963 339 p refs
(NASA TM X-51074; MTP-AERO-63-65) OTS: $19.75 ph, $10.37 mf

This paper contains progress reports of NASA-sponsored studies in the areas of spaceflight and guidance theory. The studies are carried on by several universities and industrial companies. Author

N64-12162* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DESIGN OF A DIGITAL COMMAND SYSTEM FOR THE GODDARD ROTATING SLAB SUN TRACKER
Theodore R. Colburn [1963] 26 p
(NASA-TM-X-51004; Stabilization and Control Branch Rept. 64) OTS: $2.60 ph, $0.98 mf

The digital command system for the Goddard rotating-slab sun tracker generates a command angle, compares it with the angular readout of the digital encoder, computes the digital difference between them, and converts this difference to an analog error voltage. The error signal is the input to the servo-drive which changes the position of the rotating slab. The output of the photodetector of the slab is sent to the satellite attitude-control system. The components of the digital command system are: (1) a clock; (2) a diode matrix timer; (3) a sixteen-bit digital encoder; (4) a gray to binary converter; (5) an encoder

(difference register); (6) a command generator; (7) a command register; (8) a serial subtractor; (9) a serial comparator circuit; (10) a digital-to-analog converter; and (11) a direction control circuit. I.v.L.

23 PHYSICS, GENERAL

Includes acoustics; cyrogenics; and optics. *For astrophysics see*: 05 Astronomy and Astrophysics. *For related information see*: 12 Geophysics; 29 Space Sciences; 24 Physics, Plasma; and 25 Physics, Solid-State.

N64-11444 Oklahoma State U. Research Foundation, Stillwater
MOLECULAR FLOW AND THE EFFUSION PROCESS IN THE MEASUREMENT OF VAPOR PRESSURES [Interim Report, June 1, 1962-May 31, 1863]
Robert D. Freeman Wright-Patterson AFB, Ohio, AF Materials Lab., Aug. 1963 103 p refs
(Contract AF 33(657)-8767)
(ASD-TDR-63-754, Pt. I; AD-423140)

Transmission probabilities, angular distribution functions, and recoil-force corrections have been computed for cylindrical and conical orifices. An unexpected result is that the recoil-force correction factor F exceeds unity for certain orifice parameters. The design and construction of an apparatus for the experimental study of angular distribution of molecules which effuse from nonideal orifices are described. Preliminary results are presented for the Multicell Technique for experimental evaluation of transmission probabilities; the results agree with theoretical values within ±2 percent. Testing of an electrodynamometer momentum detector, and the associated calibration of small tungsten torsion wires, are discussed. The new MIKER technique for measurement of vapor pressures below 10^{-4} atm and of molecular weights of vapors, and associated apparatus, are discussed. Author

N64-11449 University of Southern Calif., Los Angeles School of Engineering
THE DIFFRACTION OF SCALAR WAVES BY PENETRABLE DISKS
Cavour W. H. Yeh Jun. 1963 21 p refs
(Contract AF 19(604)-6195)
(USCEC-82-213; AFCRL-63-346; AD-422555; EE-29)

The exact solution of the diffraction of plane sound waves by an acoustically penetrable oblate spheroid is obtained. Results are given in terms of spheroidal functions. It is found that each expansion coefficient of the scattered or transmitted wave is coupled to all coefficients of the series expansion for the incident wave except when the spheroid degenerates to a sphere. Decoupling of the coefficients for certain cases is discussed. Author

N64-11455 California U., La Jolla
THEORY OF THE INSULATING STATE
Walter Kohn [1962] 38 p refs
(Contract Nonr-2216-(11))
(Tech. Rept.; AD-419913)

A new and more comprehensive characterization of the insulating state of matter is developed. This characterization includes the conventional insulators with energy gap, as well as systems discussed by Mott which, in band theory, would be metals. The essential property is this: every low-lying wave function Φ of an insulating ring breaks up into a sum of functions, $\Phi = \sum_{-\infty}^{\infty} \Phi_M$, which are localized in disconnected regions of the many-particle configuration space and have essentially vanishing overlap. This property is the analog of localization for a single particle and leads directly to the electrical properties characteristic of insulators. Also discussed is a soluble model exhibiting a transition between an insulating and a conducting state. Author

N64-11457 Giannini Scientific Corp., Santa Ana, Calif. Research Lab.
THEORETICAL AND EXPERIMENTAL INVESTIGATION LEADING TO DESIGN AND CONSTRUCTION OF A BROADBAND LINE SOURCE ILLUMINATOR Final Report
Alan W. Love 5 Jun. 1963 134 p refs
(Contract AF 19(604)-8385)
(AFCRL-63-302; GRL-217; AD-422370)

This report describes, in detail, the theoretical and experimental development of a corrected line source array designed to illuminate a spherical reflecting surface of specified radius R. The cone of primary illumination subtends a half angle ψ_m = 36° at the center of the spherical surface, while the paraxial focal length is f = R/2. Thus, the diameter of the aperture is D = 2R sin ψ_m, and the effective f/D ratio is 1/4 sin ψ_m, or about 0.43. Spherical aberration is corrected over a wide frequency band by a corporate feed system using broadband power dividers and dispersionless feeder cables. The final line source array contains 24 biconical dipoles arranged in 5 separate groups of 8, 4, 4, 4, and 4 elements. Center frequency is 1390 Mc, and the design goal in bandwith is the octave from 1000 to 2000 Mc. Measurements indicate that satisfactory primary illumination is achieved only over the band 1200 to 1600 Mc. At the center frequency, the phase error is within ±28°, while amplitude of primary illumination is tapered to the extent of about 7 db. Author

N64-11463 Lockheed Missiles and Space Co., Sunnyvale, Calif.
THE ABSORPTION COEFFICIENT OF NO_2 Technical Report
K. G. Mueller Aug. 1963 41 p refs
(Contract DA-49-146-XZ-198)
(DASA 1416; AD-424381)

The basic chemical reactions of NO_2 which are active during emission and absorption experiments are given. In the thermal decomposition, the transient species NO_3 is involved, and can obscure the optical measurements of NO_2 for wavelengths >5,500 A. The present knowledge of the energy levels of NO_2 is described and used as the basis for a theoretical prediction of the absorption coefficient at high temperatures. The different descriptions of the absorption used in the literature are reduced to an absorption coefficient $\bar{\kappa}_\nu$ (cm^2/g). The available experimental data of $\bar{\kappa}_\nu$ are listed in a table and presented visually in a figure. By means of a graphical extrapolation, the ranges of wavelengths between 2,500 to 8,000 A, and of temperatures from between 300° to 3,000° K, are covered. Uncl. Author

N64-11464 Weizmann Inst. of Science, Rehovot (Israel)
INVESTIGATION OF MECHANICS OF RAREFIED GASES Final Report, 1 Jul. 1958-31 Mar. 1963
C. L. Pekeris 10 Jul. 1963 43 p refs
(Contract AF 61(052)-127)
(AFCRL-63-880; AD-424376)

The linearized Boltzmann integral equation for the problem of propagation of sound has been solved, for both a Maxwell

gas and a rigid sphere gas. The solution is based on the eigenfunctions and eigenvalues of the collision operator. For the Maxwell gas, 559 eigenvalues have been computed. For the rigid sphere gas, 30 coefficients of the series expansion of each of 105 eigenfunctions have been computed, together with the corresponding eigenvalues. With these values, the sound propagation and absorption coefficients have been obtained by successive approximations. Determinants up to order n = 483 were solved for the Maxwell gas, and up to n = 105 for the rigid sphere gas. It is shown that the kernel of the linearized Boltzmann integral equation for rigid sphere molecules is not square-integrable. Author

N64-11465 Minnesota U., Minneapolis Electron Tube Research Lab.
STUDIES OF PRIMARY ELECTRON SOURCES Final Scientific Report No. 8, 1 Mar. 1961-28 Feb. 1963
D. E. Anderson Aug. 1963 203 p refs
(Contract AF 19(604)-8381)
(AFCRL-63-342; AD-424378)

Experimental results and a theoretical analysis demonstrate that, under heavy long-pulse current drain, oxide cathodes activate, as a consequence of thermal processes, in the absence of anode effects which produce the more normally observed emission decays. The velocity distribution of pulsed emission from a cathode is presented. Studies of the optical and electrical properties of oxide and sulfide cathodes under various activation and deactivation operations are summarized. The operation of superconducting field emitters, and of thin film superconductors, under hot-electron-emission conditions is discussed. High-vacuum-arc formation with a liquid Ge pool cathode is described. Author

N64-11472 Oak Ridge National Lab., Tenn
NEUTRON PHYSICS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING AUGUST 1, 1963
E. P. Blizard, A. D. Callihan, and F. C. Maienschein 10 Dec. 1963 220 p refs
(Contract W-7405-eng-26)
(ORNL-3499, Vol. I) OTS: $3.00

This report deals with a low-energy neutron physics program and covers the following sections: (1) nuclear and reactor physics—consisting largely of papers from the cross-section program, a program designed to proviae neutron cross sections for reactor calculations; (2) critical experiments—consisting of papers describing work performed both with basic critical assemblies and with reactor cores; (3) reactor shileding—consisting mainly of papers reporting shielding investigations in conjunction with civil or military defense and shielding studies for the Space Nuclear Auxiliary Power program; (4) Radiation Shielding Information Center—describing the initial efforts of this center in collecting, evaluating, and disseminating information on radiation shielding; (5) mathematics and computer programs; (6) radiation-detector studies—consisting of papers on methods for measuring low-energy radiations; and (7) theoretical water-desalination studies. I.v.L.

N64-11475 California U., Berkeley Lawrence Radiation Lab.
LOW-ENERGY NEGATIVE PION INTERACTIONS IN DEUTERIUM
William C. Bowman (Ph.D. Thesis) 5 Sep. 1963 85 p refs
(Contract W-7405-eng-48)
(UCRL-10977) OTS:$2.00

This work is an attempt to resolve the discrepancy between the measured deuterium ratio, $S = \omega(\pi^- + d \rightarrow n + n)/\omega(\pi^- + d \rightarrow n + n + \gamma)$, and values predicted from the s-wave pion relations and the theoretically calculated ratio $T = \omega(\pi^- + d \rightarrow n + n + \gamma)/\omega(\pi^- + p \rightarrow n + \gamma)$. The cross sections $\sigma(\pi^- + d \rightarrow n + n + \gamma) = (3.78 \pm 0.79) \times 10^{-20}$ cm^2 / ster, $\sigma(\pi^- + d \rightarrow n + n) = (3.67 \pm 0.45) \times 10^{-28}$ cm^2 / ster, and $\sigma(\pi^- + d \rightarrow \pi^0 + n + n) = (7.84 \pm 0.57) \times 10^{-28}$ cm^2 / ster were measured at 90° in the center-of-mass system for 51-Mev incident pion energy. The radiative absorption cross section and the s-wave pion relations indicate the value of $T = 0.91 \pm 0.19$, in agreement with theoretical calculations. The calculation of $S = 1.51 \pm 0.40$ from the cross-section measurements and the value $S = 1.92 \pm 0.33$ measured by direction detection of both reactions is in agreement with the value $S = 1.74 \pm 0.26$ calculated from the s-wave pion relations. A total-absorption plastic scintillation counter was used for all measurements. Author

N64-11488 Joint Publications Research Service, Washington, D.C.
CALCULATION OF THE LOW-FREQUENCY DIPOLE FIELD IN THE FAR ZONE
L. B. Gasanenko and G. P. Sholpo *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 27-38 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 67-77 (See N64-11484 03-01) OTS: $2.75

The functions $\bar{F}$ and $\bar{F}'$ have previously been shown to express the field components in the far zone for a dipole at the surface of a horizontally layered earth. In this paper, the main properties of F and F' and also those of the related functions G_0 and G_{-1} are deduced, and calculations based on frequency sounding curves for the far zone above a three-layer section are presented. The apparent resistivity as deduced from the electric field of a vertical magnetic dipole at the surface of the three-layered structure is plotted from calculations based on (1) asymptotic expressions of the far zone; (2) S zone frequency soundings; and (3) wave curves. The asymptote for the far zone was found to give a much better approximation of the low-frequency dipole field than either the wave zone approximation at high frequencies or the S zone approximation at low frequencies. The formulas presented for the far zone may be used in the magnetic-source electric-detector method, provided that the distance from source to detector is more than six times the distance down to the insulating base. M.P.G.

N64-11489 Joint Publications Research Service, Washington, D.C.
SOME FUNCTIONS OF THE COMPLEX ARGUMENT WHICH APPEAR IN THE LOW-FREQUENCY FIELD THEORY
L. B. Gasanenko, G. P. Sholpo, and E. I. Terekhin *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 39-70 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 78-109 (See N64-11484 03-01) OTS: $2.75

Since problems of the fields produced by a low-frequency source often have integral solutions that can be expressed via functions G_0 and G_1 of complex argument, tables for the far zone G_0 (iz) and G_1 (iz) and also for $z^2\bar{F}'(z)$ as functions of $z = \rho \exp(i\phi)$ are presented for the following values of the modulus and phase of the independent variable:

$\rho = 0(0,1)6; \phi = \pm 0(5°)45°; G_{0,1}(iz) = \mathrm{Re}G_{0,1}(iz) + i\mathrm{m}\, G_{0,1}(iz)$;

in which $z^2\bar{F}'(z) = |z^2\bar{F}'(z)|\, e^{i\alpha}$. M.P.G.

N64-11490 Joint Publications Research Service, Washington, D.C.

APPROXIMATE FORMULA FOR A DIPOLE FIELD ABOVE A HORIZONTAL LAMELLAR STRUCTURE WITH A POORLY CONDUCTING BASE

L. B. Gasanenko *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 71–74 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 110–113 (See N64-11484 03-01) OTS: $2.75

The simple asymptotic expression available for the wave zone of a low-frequency dipole are shown to give unsatisfactory results when used to prepare wave-zone curves of a horizontal lamellar structure above a poorly conducting base, because these expressions do not account for the energy propagating in the base. An approximate expression is derived which includes this energy and is applicable for general purposes at medium wavelengths and at medium values of r/d_1. Curves prepared by the asymptotic wave method, the approximate method, and exact numerical methods were compared. The results show that the approximate expression gives curves which are almost precisely the same shape as the exact curve, although the approximate curve is somewhat displaced. More accurate expressions could be derived by expanding the formal solutions as power series in $(m - m_0)$ in which m_0 is a function of λ, r/d_1, and the structure of the section. M.P.G.

N64-11492 Joint Publications Research Service, Washington, D.C.

COMPARISON OF THE INDUCTION METHOD WITH THE DIPOLE ELECTROMAGNETIC METHOD ON A THIN CONDUCTING PLATE (MODEL)

G. V. Molochnov and G. M. Grebennikov *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 85–89 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk. (Leningrad), v. 303, no. 13, 1962 p 129–134 (See N64-11484 03-01) OTS: $2.75

A comparison study of the induction method and the dipole electromagnetic method was made using identical equipment and conditions. The field was produced by a screened frame fed via a screened cable; the detecting coil also had a screened frame and was associated with a tuned amplifier feeding a vacuum tube voltmeter. The source and receiving sections had identical parameters. A brass sheet, supported on an insulator and fitted with a means of adjusting the inclination, was used as a model. The inclination of the total field vector to the horizontal was measured as the sheet was rotated through 90° while the top edge of the sheet was maintained in a horizontal position. In all cases, the model was moved while the coils were kept fixed. The methods used for the determination of the electrical axis using the dipole and the induction techniques are shown to be reliable in each case. The results indicate that the induction method gives the position of the top edge satisfactorily only for r/h of 3 to 4 but that the dipole method is suitable for any r. M.P.G.

N64-11493 Joint Publications Research Service, Washington, D.C.

REPRESENTATION OF OBSERVATIONAL DATA OF ALTERNATING-CURRENT PROSPECTING AS AN APPARENT SPECIFIC RESISTANCE

A. V. Veshev *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 90–105 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 167–186 (See N64-11484 03-01) OTS: $2.75

The apparent specific electrical resistance, a parameter commonly used in expressing dc prospecting results, is shown to be of value for geologic mapping and structural studies using ac methods. Methods of expressing the results of ac methods as reduced parameters of apparent resistance type are discussed. The particular apparent resistance to be used is chosen on the basis that its dimensions and numerical value must be the same as the specific resistance for a homogeneous and isotropic half-space. This being the case, an inhomogeneous half-space gives a parameter which is analogous to the specific resistance. The effect of inhomogeneity can then be expressed as a ratio of the apparent resistance to the specific resistance common to all systems. Alterations of the induction technique to obtain measurements in apparent resistance form are also discussed. M.P.G.

N64-11495 Joint Publications Research Service, Washington, D.C.

METHODS OF CALCULATING A POINT-SOURCE FIELD IN THE PRESENCE OF A VERTICAL BED

N. A. Sakharnikov and D. M. Volkov *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 112–123 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 193–202 (See N64-11484 03-01) OTS: $2.75

The necessity of solving for the potential distribution of the field of a point source in the presence of two interfaces, in order to calculate apparent resistance curves from electrical profiling above a stratum of low or high resistance, is established. Equations representing the potential at any point in the field for each of three media are presented and developed according to a coordinate system. Infinite series expressions for the apparent resistance for potential systems and for gradient systems are developed by summation and convergence techniques. M.P.G.

N64-11498 Joint Publications Research Service, Washington, D.C.

CONCERNING THE VERTICAL TORSION BALANCE THEORY

B. V. Gran *In its* Recent Develop. in Geophys. 22 Apr. 1963 p 130–137 refs Transl. into ENGLISH of an article from Uch. Zap. Leningr. Gos. Univ., Ser. Fiz. i Geol. Nauk (Leningrad), v. 303, no. 13, 1962 p 278–287 (See N64-11484 03-01) OTS: $2.75

The measurement of the vertical gradient of the gravitational acceleration (U_{zz}) by a vertical torsion balance is considered by examining the equation of equilibrium for a body of arbitrary shape, having a horizontal axis of rotation that does not pass through the center of mass. The following conclusions are drawn: (1) The displacement of the center of mass from the axis of rotation cannot be neglected; a displacement of 10^{-4} cm causes a torque that is several orders of magnitude greater than that arising from the second derivatives; further, this torque is not constant during absolute measurements of U_{zz}. (2) Relative measurements of U_{zz} could be made if the tilt of the beam were to remain constant when the balance is moved, but the permissible displacement of the center of mass is then less than 1 A; such stability is at present unattainable. Therefore, some means other than a vertical torsion balance should be sought to measure U_{zz}. M.P.G.

N64-11543 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Tech. Div.

ON A POSSIBLE METHOD OF MEASURING CONCENTRATIONS OF IONS, GENERATED BY HYDROIONIZERS

M. I. Korsunskiy, M. B. Reznik and R. M. Truten' 14 Aug. 1963 8 p refs Transl. into ENGLISH from Izv. Vysshikh Uche. Zavedeniy, Fiz. (USSR), no. 6, 1962 p 152–156 (FTD-TT-63-666/1+2; AD-414997)

An ion counter for measuring the concentration of ions produced by Mikulin-type hydroionizers is described. Using this counter, it was established that: (1) Negative ions with a mass from 10^{-14} to 10^{-15}g per unit charge are present in the ion stream. (2) The mass spectrum of the heavy negative ions in the range 10^{-14} to 10^{-15} is linear. Also, the rapid determination of the ratio Z = N+/N− by comparing the time discharge of an alternately positively and negatively charged sphere, provided the diameter of the sphere exceeds by several times the cross section of the ion stream, is discussed. In th above ratio, N+ is the density of all positive ions and N− is the density of all negative ions. I.v.L.

N64-11546 Iowa State U. of Science and Tech., Ames
QUANTUM EFFECTS IN THE CALCULATION OF THE TRANSMISSION COEFFICIENT AS APPLIED TO REACTION RATE CONSTANTS
Ronald Bruce Lantz and R. W. Fahien May 1963 176 p refs
(Contract W-7405-eng-82)
(IS-677) OTS: $2.75

Quantum effects in the calculation of the transmission coefficient on the basis of the collision theory were found to be important when specific potential energy models were assumed. The fraction of collisions which are effective in reaction as obtained from a consideration of quantum results was typically about one half the fraction obtained classically. Results obtained from each of the potential models could not be considered classical except over an extremely limited temperature range. Over most of the temperature range, either effective penetration or reflection was important for each of the potential models used. Effective penetration represents collisions which are effective in reaction with energy less than the activation energy; reflection represents collisions which are ineffective in reaction at an energy exceeding the activation energy. Author

N64-11561* National Aeronautics and Space Administration, Washington, D.C.
ELECTRON AND ION EMISSION
L. N. Dobretsov Nov. 1963 352 p refs Transl. into ENGLISH of Publ. "Elektronnaya i ionnaoa emissiya", Moscow-Leningrad, State Publishing House for Tech. and Theoret. Lit., 1952
(NASA TT F-73) OTS: $5.00

This work represents a collection of Russian studies in the field of physical electrons, covering the appearance of charged particles (electron and ion emissions), their motion in a vacuum or a very rarefied gas (electric or ionic optics), and their disappearance at electrodes. The results of the investigations and the theoretical explanation of the phenomena studied are chiefly examined. In some cases, the results of the investigations are given in the form of diagrams, rather than in the form of graphs taken from the original works. Author

N64-11579 California U., Livermore. Lawrence Radiation Lab.
EFFECT OF BETATRON OSCILLATIONS ON THE LONGITUDINAL STABILITY OF A COASTING BEAM
V. Kelvin Neil 12 Sep. 1963 16 p refs
(Contract W-7405-eng-48)
(UCRL-6794) OTS: $0.50

The stabilizing effect of radial betatron oscillations with regard to longitudinal bunching of an accelerator beam is investigated. A spread in particle circulation frequency arises from a spread in betatron oscillation amplitude. It is shown that this frequency spread is always sufficient to prevent bunching when the beam is coasting at the transition energy. At other energies, a spread in canonical angular momentum also results in a frequency spread. A criterion is developed that places a lower limit on the sum of the squares of these two frequency spreads necessary for stability above the transition energy. Author

N64-11580 California U., Livermore. Lawrence Radiation Lab.
A ROD-CONDUCTION RADIOMETRIC CALORIMETER
Stuart R. Gunn 11 Sep. 1963 14 p refs
(Contract W-7405-48)
(UCRL-7488) OTS: $0.50

A twin rod-conduction calorimeter for routine assay of small radioactive sources is described. The equilibration time is about 40 minutes and the detection limit about 1×10^{-4} wt. A thermistor circuit and nonlinear potentiometer are used for the differential temperature measurement. Use of a plutonium sample for calibration is described. Author

N64-11581 California U., Livermore. Lawrence Radiation Lab.
THE COEFFICIENTS CONNECTING THE STARK AND FIELD-FREE WAVE FUNCTIONS FOR HYDROGEN: THEORY AND APPLICATION TO LORENTZ DISSOCIATION
C. Bruce Tarter 5 Sep. 1963 44 p refs
(Contract W-7405-eng-48)
(UCRL-7493) OTS: $1.00

A general expression for the expansion coefficients connecting the Stark (parabolic coordinates) and field-free (spherical coordinates) wave functions for hydrogen is obtained. Numerical tables of these coefficients through principal quantum number n = 10 are given. In the course of the derivation, several new identities involving generalized hypergeometric functions are deduced. Applications to radiative attenuation, particularly in connection with the ALICE experiment, are discussed. It is concluded that previous calculations have considerably underestimated the degree of radiative attenuation experienced by the ALICE beam, thus decreasing the amount of Lorentz dissociation expected in the plasma region. Author

N64-11582 California U., Livermore. Lawrence Radiation Lab.
CHARACTERISTICS OF THE LPTR FAST NEUTRON IRRADIATION FACILITY
Garth E. Cummings and Gordon V. Pefley, Jr. 20 Sep. 1963 17 p refs
(Contract W-7405-eng-48)
(UCRL-7513) OTS: $0.50

A Fast Neutron Irradiation Facility has been put into operation at the Livermore Pool Type Reactor (LPTR). This facility was designed to irradiate samples in a neutron flux having an energy distribution approximating a U^{235} fission spectrum. Two uranium–aluminum alloy plates convert the thermal neutrons (from a graphite thermal column) to fission energy neutrons, yielding a flux between 10^{10}–10^{11} n/cm^2-sec in the sample location. The air-cooled plates produce 900 w of power with the LPTR at a nominal power level of 2 Mw. Author

N64-11584 California U., Berkeley. Lawrence Radiation Lab.
CYCLOTRON ORBITS: A 709 RAY-TRACE PROGRAM FOR CYLINDRICALLY SYMMETRIC MAGNETIC FIELDS
Joe Good, Morris Pripstein, and Howard S. Goldberg 3 Oct. 1963 23 p refs
(Contract W-7405-eng-48)
(UCRL-11044) OTS: $0.50

Cyclotron Orbits is a 709 program for tracing secondary beams out of a cylindrically symmetric magnetic field. Development of a 6-by-6 transfer matrix allows coupling to external quadrupole and bending magnets. Author

N64-11587 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
COOLANTS
Josef Zboril 31 May 1963 16 p refs Transl. into ENGLISH of part of a book "Materialy Jadernych Reaktoru", Prague, 1958 p 132–141
(FTD-TT-61-478/1+2; AD-409311)

Physical and nuclear properties of gaseous, liquid, metal, and liquid-metal coolants are given. R.T.K.

N64-11596 Brown Engineering Co., Inc., Huntsville, Ala. Research Dept.
THEORY OF GASEOUS BREAKDOWN MECHANISM
S. T. Nolan Oct. 1963 21 p refs
(Tech. Note R-75)

Experimental results were consistent with the theory that the criterion (the Townsend relation) for breakdown is set up before the space charge of the ionization current becomes large enough to distort the field significantly. The early stages of temporal growth of current in an overvolted gap have also been shown to take place by Townsend mechanisms. However, since the current increases with time it must eventually distort the field and produce glow or arc conditions, depending on the electrode properties which determine the glow-to-arc transition as the potential falls. R.T.K.

N64-11632 Los Alamos Scientific Lab., N. Mex.
A RADIATION REACTOR CONCEPT (GLOWWORM)
L. D. P. King 18 Nov. 1963 51 p
(Contract W-7405-eng-36)
(LAMS-2427) OTS: $1.25

A reactor concept which uses radiation as the principal heat-transfer mechanism between reactor core and heat exchanger is described. Calculations for spherical and cylindrical geometry are presented, together with preliminary studies of promising high-temperature fuels. Possible applications for such a reactor and areas for future research and development are outlined. Author

N64-11642 Brookhaven National Lab., Upton, N.Y.
PROPERTIES OF QUADRUPOLE MAGNET DOUBLETS
W. F. Baker May 1963 46 p refs
(Supported by AEC)
(BNL-795-(T-304)) OTS: $1.25

The optical properties of a quadrupole doublet are presented for two focusing conditions—in the first, the beam from a point object is rendered parallel in both the vertical and horizontal planes, and in the second, the beam from a point object is focused to a point image in the vertical and horizontal planes simultaneously. The doublet consists of two magnets of the same length and aperture. The properties are given in their reduced form so that they may be used directly for magnets of any size. The object and image distances and the separation of the magnets were specified; the resulting simultaneous transcendental equations were solved by the Newton–Raphson method in order to find the required field gradients of the quadrupole magnets. P.V.E.

N64-11643 Brookhaven National Lab., Upton, N.Y. Sigma Center
OPTICAL MODEL ANALYSIS OF INELASTIC SCATTERING OF NEUTRONS BY HEAVY NUCLEI
S. O. Moore and E. H. Auerbach Aug. 1963 47 p refs
(Supported by AEC)
(BNL-818-(T-317)) OTS: $1.25

The results obtained in a study of elastic and inelastic scattering of neutrons by heavy elements in the Mev region are presented. The isotopes used represent a variety of deformed and spherical nuclei in the heavy-element region, and the calculational approach used a spherical optical potential. Calculated differential, elastic, scattering cross sections of uranium 238, thorium 232, gold 197, tungsten 184, and tantalum 181 are presented in tabulated form for intervals of 0.1 -Mev lab energy from 0.1 to 2.0 Mev. P.V.E.

N64-11645 Brookhaven National Lab., Upton, N.Y.
REPORTS TO THE AEC NUCLEAR CROSS SECTIONS ADVISORY GROUP [MEETING AT] RICE UNIVERSITY, 25 FEBRUARY 1963
John R. Stehn et al Jul. 1963 46 p refs
(WASH-1042) OTS: $1.25

These reports contain a statement of recent developments, changes of emphasis, and preliminary data of importance to the cross-section-measurement program of the Atomic Energy Commission. R.T.K.

N64-11754 General Dynamics/Fort Worth, Tex. Engineering Dept.
INVESTIGATION OF PHASE CHANGES IN ICE SOLUTIONS BY ELECTRICAL RESISTIVITY MEASUREMENTS
H. J. Weltman 4 Nov. 1963 11 p refs
(Contract AF 33(657)-11214)
(ERR-FW-173; AD-423175)

Electrical resistivity measurements have been employed to study the phase changes in ice solutions from 0° C to −196° C. Conductivity curves as a function of temperature are presented for various concentrations of salts in ice over the temperature range. The transition from the hexagonal structure to the cubic structure is dramatized in these curves. This transition was found to be affected by the concentration of salt in the solution and by the rate of cooling of the frozen solutions. X-ray diffraction patterns of the ice solutions were taken and are presented and correlated with the conductivity data.
Author

N64-11755 Cornell U., Ithaca, N.Y.
APPLICATION OF THE QUANTUM DEFECT METHOD TO PHOTOIONIZATION CALCULATIONS Technical Report No. 2
E. J. Mc Guire Aug. 1962 41 p refs
(Contract DA-31-124-ARO(D)-43)
(AROD-2810-12; AD-423664)

A discussion is given on the use of the Hartree method and the hydrogenic approximations. The quantum defect method is used in cross-section calculations on the high-energy region of the tail of the neon 12 absorption edge. Application of this method to the K absorption in light elements is also discussed. Author

N64-11756 Scope Inc., Falls Church, Va.
PRENORMALIZATION OF PHOTOGRAPHIC RECONNAISSANCE DATA Final Technical Report
Malcolm R. Uffelman et al Griffiss AFB, N.Y., Rome Air Develop. Center, 1 Nov. 1963 139 p refs
(Contract AF 30(602)-2709)
(RADC-TDR-63-341; AD-422099)

The purpose of the program is to develop techniques for the processing of photographic data into a form suitable for use with an adaptive memory type of cognitive system. The particular adaptive system to be considered is a conditioned-reflex system called CONFLEX I. A first step toward the solution to the problem was found in the integral scanning process which extracts video data in a manner which preserves essential aspects of image continuity and spatial relationships of objects in a scene. Since the integral scan sequence is an extrapolation of a special form of spatial frequency analysis, the task of processing the resultant waveform to generate the desired image transformation reduces to a two-level harmonic analysis of the integral scan waveform. The resultant transformation of image data provides the necessary input to an adaptive system which can classify the superimposed "signatures" of selected or composite objects. Author

N64-11771 Harry Diamond Labs., Washington, D.C.
OSCILLATIONS IN AN ARGON DISCHARGE
M. J. Reddan, A. L. Ward, and D. J. Belknap 4 Nov. 1963 18 p refs
(Contract DA-5B99-25-001)
(HDL-TR-1182; AD-423676)

Various oscillatory phenomena are presented that were observed in a low-pressure glow discharge in argon. For certain conditions, photographs of the discharge are correlated with oscillograms and the static characteristic. A nearly linear variation of oscillation frequency with tube current is shown over several orders of magnitude. Under certain conditions, small-amplitude prebreakdown oscillations are observed, their number varying over a very small range of tube current. Conditions for a stable discharge are outlined. When the tube stability conditions are taken into account, it is shown that V-I curves can be obtained that include reliable data in the negative slope region. Author

N64-11775 Battelle Memorial Inst., Columbus, Ohio
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING SEPTEMBER 1963
Russell W. Dayton and Ronald F. Dickerson 1 Oct. 1963 69 p refs
(Contract W-7405-eng-92)
(BMI-1650 (Del.)) OTS: $1.75

The current status of progress in the following areas is presented: (1) reactor materials and components; (2) reactor-fuel studies; (3) the fabrication of cermet-fuel elements; (4) the roles of surface chemistry and interatomic forces in solid-state pressure bonding; (5) graft polymerization studies; (6) the development of high-dielectric-constant, low-dielectric-loss polymers using gamma irradiation; (7) coated-particle fuel materials; (8) corrosion studies of the fluoride-volatility process; (9) the long-term creep-rupture program on sintered-aluminum-powder alloys; (10) the mechanical properties of zirconium alloys; (11) the deposition behavior of various fission products in an out-of-pile loop system; (12) studies of the fabrication parameters and phase relationships in the UO_2-ZrO_2 system and of the irradiation stability and the properties of the UO_2-ZrO_2 bodies; (13) the postirradiation examination of Hastelloy X cladding from AGN 1B-8T-1 and -2 subassemblies; and (14) the development of methods for joining metal diaphragms into cells and for melting, fabricating, and joining special alloy foils for use in the regenerative cell program at ANL. I.v.L.

N64-11787 Sandia Lab., Alburquerque, N. Mex.
PROJECT SCOOTER PLOWSHARE PROGRAM Final Report
William R. Perret, Albert J. Chabai, Jack W. Reed, and Luke J. Vortman Oct. 1963 168 p refs
(Supported by AEC)
(SC-4602(RR))

Project Scooter was a cratering experiment devised as a part of the Plowshare study of large-scale explosions as excavation tools. The Scooter explosive was approximately one million pounds of TNT stacked in a spherical cavity centered at a depth of 125 ft in desert alluvium. This report includes results of studies of crater dimension, throwout material distribution particle motion, ground motion, dust cloud growth, and long-range air blast. The crater produced by Scooter was 75 ft deep, had an average diameter of 307 ft, and a volume of nearly 100,000 yd^3. Crater dimensions for chemical explosions up to a million pounds of TNT were found to fit overburden approximate scaling best. Author

N64-11792 Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
PRESSURE INTENSIFICATION PROVIDED BY EXTERNAL PRESSURE ON A CYLINDER COMPOSED OF FOUR ANVILS
R. L. Huddleston 6 Dec. 1963 119 p refs
(Contract W-7405-eng-26)
(Y-1449) OTS: $2.25

An experimental investigation was made to determine the pressure intensification provided by, and the maximum stresses in, a system of anvils to be used in a pressure intensifier. Seven radial section models and one longitudinal section model were studied. Anvil sizes ranged 7 1/4 to 10 1/4 inches outside diameter. The results of the study indicated a need for several design changes to improve intensification and to reduce stress concentrations. The anvils were redesigned accordingly. Author

N64-11793* New Mexico U., Albuquerque
DC TO AC CONVERSION USING MAGNETORESISTANCE
Richard Bechtel, W. W. Grannemann, and Bill Harper [1963] 16 p refs Presented at the Electron Devices Meeting of Intern. Conf. on Hall Effect Appl., Washington, D.C., 1 Nov. 1963
(NASA Grant NsG-279-62)
(NASA CR-52910) OTS: $1.60 ph, $0.80 mf

The topics discussed are: (1) classical magnetoresistance; (2) the magnetoresistance effect in the compound semiconductor, InSb; (3) configurations for magnetoresistance elements; (4) circuit analysis; (5) conversion efficiency for the bridge MR converter, and (6) magnetoresistance experiments. R.T.K.

N64-11898* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE NONLINEAR RESPONSE OF WINDOWS TO RANDOM NOISE
Henry S. Freynik, Jr. Washington, NASA, Dec. 1963 22 p refs Part of the inform. in this report previously published in Sound, v. 2, no. 3, May–Jun. 1963 p 31-33
(NASA TN D-2025) OTS: $0.50

The stress response of a 36-$in.^2$, 1/8-in.-thick window-glass plate mounted in putty on wooden frames was measured into the nonlinear range for both uniform static pressure and for random noise. It was determined from the stresses and frequencies that this edge mounting approximated simply supported conditions. The measured center stresses were in agreement with the nonlinear theory for static loading. The

location of the maximum tensile stress in the plate was observed to migrate away from the center of the plate along the diagonals; this result was not anticipated by the available theoretical analyses. The peak tensile stresses at the center of the plate exposed to random noise were compared with theoretical stresses estimated by the procedure of Miles. Good agreement was observed at low noise levels where the plate response was approximately linear. At higher noise levels, the response became increasingly nonlinear in a hard-spring manner, and, hence, the theory overestimated the actual stresses. Author

N64-11916 Joint Publications Research Service, Washington, D.C.
ON THE DISPLACEMENT OF A DEFORMABLE BODY IN AN ACOUSTIC MEDIUM
L. I. Slepyan 18 Dec. 1963 13 p refs Transl. into ENGLISH of an article from Prikl. Mat. i Mekh. (Moscow), v. 27, no 5, 1963 p 918–923
(JPRS-22344; OTS-64-21054) OTS: $0.50

The determination of the displacement of a deformable body under the influence of a nonstationary acoustic wave of arbitrary shape is considered. Some general conclusions are reached as to the effect which the characteristics of the medium and the deformation of the body have on the final displacement of the body when time if $t = \infty$. It is shown that the final displacement of the body submerged in a viscous fluid does not depend on its buoyancy. R.T.K.

N64-11924 Air Force Systems Command, Wright-Patterson AFB, Ohio
ELECTRON SPIN RESONANCE (ESR) STUDY OF GAMMA IRRADIATED SOLID ACETONITRILE Technical Report [Jan.–Jun. 1963]
L. A. Harrah, R. E. Rondeau, S. Zakanycz, D. Hale, and D. Dunbar Sep. 1963 27 p
(ASB-TDR-63-785; AD-423525) OTS: $0.75

The solid phase Cobalt-60 radiolysis of acetonitrile was investigated. Free radicals produced during the exposure to gamma rays were studied with an electron-spin resonance spectrometer, and the final products were determined by gas chromatography and mass spectrometry. Predominant products are hydrogen, methane, and succinonitrile. The reaction paths to these products are inferred from, and consistent with, the ESR spectra of the trapped free radicals. Author

N64-11934 Air Force Cambridge Research Labs., Bedford, Mass.
CHARGE TRANSFER STUDIES WITH A TIME-OF-FLIGHT MASS SPECTROMETER: CROSS SECTION FOR N_2^+ ON N_2 AT 2650 ELECTRON VOLTS Research Report
W. W. Hunt, Jr., A. J. Stinnett, and R. Novack (Device Development Corp.) Sep. 1963 13 p refs
(AFCRL-63-709; AD-422864) OTS: $1.60

A method of using the drift tube of an adapted time-of-flight mass spectrometer as the collision chamber for measuring charge-transfer cross sections is described in detail. As a test of this method, the process

$$N_2^+ + N_2 \rightarrow N_2^o + N_2^+$$

has been investigated at an N_2^+ energy of 2650 ev (laboratory system). From the data obtained, the cross section for this process was determined to be $\sigma = .1/\alpha\ (2.96 \pm 0.20) \times 10^{-15}\ cm^2$, where α is an unknown pressure-gage sensitivity factor, and the uncertainty refers to random errors only. Author

N64-11935 Oxford U. (Gt. Brit.)
FLUORINE ENDOR IN CALCIUM FLUORIDE Technical Scientific Note No. 1
J. M. Baker and J. P. Hurrell May 1963 33 p refs Submitted for Publication
(Contract AF 61(052)-677)
(AFCRL-63-502; AD-423548) OTS: $3.60

The method of electron nuclear double resonance (ENDOR) has been used to measure the interaction between a Eu^{++} ion in CaF_2 and its ligand fluorine nuclei. Expressing the interaction in the form $A_s\underline{S}\cdot\underline{I} + A_p(3S_zI_z - \underline{S}\cdot\underline{I})$, with z along the bond axis, the parameters are found to be $A_s = -2.23 \pm 0.01$ Mc and $A_p = +4.01 \pm 0.01$ Mc. The value of A_s is of the same sign but a factor of four smaller than the value predicted theoretically by Freeman and Watson. Interactions with next nearest neighbor fluorine nuclei are found to be nearly dipolar. Also discussed is the possible line shift and line broadening of both fluorine and europium ENDOR, due to high order effects in the fluorine and europium hyperfine interactions. Author

N64-11937 Emmanuel Coll., Boston, Mass. Research Language Center
APPROXIMATE EXTERNAL CONDITIONS IN ELECTROMAGNETISM [SULLE CONDIZIONI AL CONTORNO APPROSSIMATE NELL'ELETTROMAGNETISMO]
Dario Graffi L. G. Hanscom Field, Mass., AF Cambridge Res. Labs. [Jan. 1963] 14 p refs Transl. into ENGLISH of an article from Atti Accad. Sci. Ist. Bologna, Classe Sci. Fis., Ser. II, no. 5, 1958 p 88–94
(Contract AF 19(604)-8505)
(E-T-I-63-1; AD-411497)

Skelkunov stated the approximate external conditions by means of the tangential components of the electric field. Based on this reasoning, a second approximation for the external conditions is derived and applied to the case of the homogeneous, flat earth. I.v.L.

N64-11956 Atomics International, Canoga Park, Calif.
THE AGE OF FISSION NEUTRONS TO INDIUM RESONANCE ENERGY IN WATER. PART I: EXPERIMENT
R. K. Paschall 30 Nov. 1963 40 p refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-8621) OTS: $0.75

The age of fission neutrons to indium resonance energy (1.46 ev) was measured in water using a plane fission source of finite diameter and essentially infinite plane detectors. This is equivalent to a measurement using axial detectors with an infinite plane source. Thus, unlike recent measurements which used axial detectors with large plane sources, these results do not require calculated corrections to extrapolate to infinite source geometry. The remaining corrections are small and well understood. The age measured in this experiment was $26.45 \pm 0.32\ cm^2$ at a density of 1.0 gm/ml. Author

N64-11964 Holmes and Narver, Inc., Los Angeles, Calif.
RADIATION SHIELDING AND RESPONSE STUDIES OF AEC TEST STRUCTURES
R. A. Cameron, Jr. and P. H. Huff Las Vegas, Nov., AEC, 10 Dec. 1963 57 p refs
(WT-1723) OTS: $1.25

The two primary objectives were to determine the variation of the radiation dose in different positions inside four small shallow-buried reinforced-concrete test structures, and to compare the accelerations inside two of these structures with the accelerations in the adjacent free field. Considerable variation was observed in the radiation dose for the various locations in the structures. The average radiation

readings in the structures were higher by a factor of about 3 than those predicted. Energy-dependent film badges, which also were strongly direction dependent, indicated that the radiation near the bottom of the structures was approximately isotropically distributed. However, calculated doses at individual badge locations, based on the isotropic distribution, did not agree well with observed doses. In all cases, the peak accelerations recorded inside the shelters were higher than the corresponding free-field peaks. Author

N64-11971 Joint Publication Research Service, Washington, D.C.
CONCERNING THE EQUATION OF STATE OF HELIUM
A. S. Predvoditelev *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 64–76 refs (See N64-11965 03-01) OTS: $3.50

An equation of state for helium is presented which provides calculated data having a maximum error of 0.04% when compared to experimental data. The equation of state (for helium in the temperature range from 0° to 150° C and in the density range from 9 to 180 Amagat units) is as follows:

$$pv/RT + [1.8 + 0.245(T - T_0)]10^{-6}\rho + 7.2 \times 10^{-10}\rho^3 = \psi(r),$$

where $r = 1.31 \times 10^{-4}\rho$ and $\psi(r)$ is a universal function in which the correlation coefficient is proportional to the density. P.V.E.

N64-11972 Joint Publications Research Service, Washington, D.C.
THE EQUATION OF STATE AND THERMODYNAMIC PROPERTIES OF OXYGEN
P. M. Kesselman *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 77–86 refs (See N64-11965 03-01) OTS: $3.50

The equation of state is derived for molecular oxygen in the temperature range −200° to 3,000° C, for pressures up to $500 \cdot 10^5$. No account is taken of the dissociation of oxygen at high temperatures. Author

N64-11985 Los Alamos Scientific Lab., N. Mex.
HARTREE SCATTERING FACTORS FOR ELEMENTS 2 THROUGH 98 AND FOR SEVERAL IONS
Don T. Cromer, Allen C. Larson, and James T. Waber 27 Nov. 1963 97 p refs
(Contract W-7405-eng-36)
(LA-2987) OTS: $2.00

Scattering factors have been computed from Hartree self-consistent-field wave functions for the elements of atomic number 2 through 98 and for several of their ions. The values are listed in tabular form as a function of $s = \sin\theta/\lambda$, from $s = 0$ to $s = 1.99\ A^{-1}$, at intervals of $0.01\ A^{-1}$. The values are also given as analytic functions. Author

N64-11986 California U., Berkeley Lawrence Radiation Lab.
MUTUAL CHARGE NEUTRALIZATION OF GASEOUS IONS
James Carl Person 11 Jul. 1963 148 p refs
(Contract W-7405-eng-48)
(UCRL-10904) OTS: $2.50

Investigated is the problem of the bimolecular rate constant, α, for the mutual charge-neutralization reaction (ion–ion recombination) for ions formed by the vacuum ultraviolet photolysis of nitric oxide. The pressure dependence of α over a pressure range of 10 to 600 torr is measured for mixtures of a few hundred microns of NO with He, Ar, Kr, Xe, H_2, D_2, and N_2. From the low-pressure limit of α, it is determined that the rate constant for charge neutralization in the absence of a third body is $k_0 = 2.1 \pm 0.4 \times 10^{-7}\ cm^3/sec$. The high-pressure limit of α is estimated to be $2.0 \pm 0.5 \times 10^{-6}\ cm^3/sec$. The third-body efficiencies for promoting the charge-neutralization reaction are measured; the results, relative to He as the third-body gas, are $H_2 = 1.4 \pm 0.4$, $D_2 = 1.5 \pm 0.4$, Ar = 3.6 ± 0.8, Kr = 4.3 ± 1.0, $N_2 = 5.2 \pm 1.1$, and Xe = 6.8 ± 1.5. A detailed computer calculation of the three-body charge-neutralization process considers that the rate of charge neutralization is the rate at which ion pairs are deactivated by collision with the neutral gas molecules to form ion pairs which cannot separate to large distances. Author

N64-11988 California U., Berkeley Lawrence Radiation Lab.
HYPERFINE STRUCTURES AND ANOMALY OF Li^6 AND Li^7, AND THE HYPERFINE STRUCTURES OF Re^{186} AND Re^{188}
Richard G. Schlecht 3 Oct. 1963 86 p refs
(Contract W-7405-eng-48)
(UCRL-11047) OTS: $2.00

This paper describes two independent experiments using the atomic-beam magnetic-resonance flop-in technique. A different atomic-beam machine was used for each experiment. The first experiment involved the measurement of the hyperfine structures of the two stable isotopes of lithium, Li^6 and Li^7; the great accuracy of these measurements enabled the determination of a value for the hyperfine-structure anomaly between the two isotopes. The second experiment involved the measurement of the hyperfine structures of two of the radioactive isotopes of rhenium; a brief description of the theory of electronic structure is given. The theory of hyperfine structures and the Bohr–Weisskopf theory of hyperfine-structure anomalies are also discussed. Additionally, the basic principles of the atomic-beam method are briefly described. Author

N64-11989 California U., Berkeley Lawrence Radiation Lab.
THE ISOMER RATIO OF Ce^{137m}-Ce^{137g} PRODUCED IN SEVERAL CHARGED-PARTICLE REACTIONS
Richard Leslie Kiefer (Ph.D. Thesis) 17 Oct. 1963 92 p refs
(Contract W-7405-eng-48)
(UCRL-11049) OTS: $2.00

The isomer ratio of Ce^{137m} to Ce^{137g} is studied to obtain information on the effect of angular momentum in the deexcitation of a compound nucleus. The ratio of the formation cross section of the high-spin isomer to that of the low-spin isomer is measured as a function of energy for reactions induced by He^3, He^4, Li^7, and C^{12}. The ratio is seen to increase with increasing projectile energy. This increase is shown to correspond to an increase in the average angular momentum. The ratio at the peak of the excitation function is found to increase linearly from reaction to reaction with increasing (I). Above the peak of the excitation function, the ratio is observed to increase more rapidly. This is considered to be due to the competition of neutron and γ-ray emission that causes the product to be formed from states of high angular momentum. The cross sections are also measured for the four reactions. Those induced by Li^7 and C^{12} peak 5 to 6 Mev above the cross sections induced by He^3 and He^4. Author

N64-11990 California U., Berkeley Lawrence Radiation Lab.
K^* AND N^* PRODUCTION BY 1.96-BeV/C K^+ MESONS INTERACTING WITH HYDROGEN
Thomas Alphonsus O'Halloran, Jr. 16 Oct. 1963 59 p refs
(Contract W-7405-eng-48)
(UCRL-11068) OTS: $1.25

The Brookhaven National Laboratory's 20-in. hydrogen bubble chamber was exposed to a separated K^+-meson beam. Cross sections for the inelastic processes at 1.96 Bev/c are measured. The inelastic processes are dominated b the production of two resonances, the I = 1/2 K-π resonance (K^*), and the I = 3/2 pion-nucleon resonance (N^*). The four-particle state is dominated by the simultaneous production of these two resonances. Experimental evidence is presented which indicates that the one-pion exchange dominates this reaction for momentum transfers as high as 25 m_π^2. The observed cross section can be calculated by including a form factor in the one-pion-exchange calculations. The three-particle state is also dominated by the production of either the K^* or N^*. Production of the N^* cannot proceed via the one-pion exchange. Experimental evidence is presented which indicates that this process proceeds via the exchange of a vector meson. Author

N64-12015 Space Technology Labs., Inc., Redondo Beach, Calif.
LUMINESCENCE OF SAMARIUM AND EUROPIUM β-DIKETONE INTERNAL COMPLEXES (ISSLEDOVANIE LYUMINESTSENTSII VNUTRENNIKH KOMPLEKSNYKH SOEDINENII SAMARIYA I EVROPIYA S β-DIKETONAMI)
A. N. Sevchenko and A. G. Morachevskii Mar. 1963 15 p refs
Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Fiz. (Moscow), v. 15, no. 5, 1951 p 628–636
(STL-TRANS-74; Rept. 9990-6387-KU-000)

In order to study luminescence processes, complex compounds of samarium and europium with benzoylacetone, dibenzoylmethane, and acetylacetone were synthesized. The absorption and luminescence spectra of the organic complex compounds of europium and samarium and their solutions were investigated. The following tables are included: (1) visible spectrum lines of luminescence of samarium crystal compounds at liquid air temperature; (2) visible spectrum lines of luminescence of europium crystal compounds at temperatures of +20° C and −185° C; (3) visible spectrum lines of luminescence of Eu dibenzoylmethide solutions at liquid air temperature, and (4) a comparison of the Eu dibenzoylmethide solutions and the rhodamine B solution luminescence efficiencies. R.T.K.

N64-12024* Pennsylvania U., Philadelphia Inst. for Direct Energy Conversion
STATUS REPORT AS OF OCTOBER, 1963
21 Oct. 1963 35 p
(NASA Grant NsG-316)
(NASA CR-52978) OTS: $3.60 ph, $1.25 mf

This report presents a summary of accomplishments (abstracts of papers presented by Institute personnel), work in progress, and work planned. The areas studied include: (1) thermal energy storage—materials synthesis and heat transfer studies; and (2) plasma physics—magnetohydrodynamic power, nonequilibrium ionization, thermionic energy conversion, and biochemical fuel cells. P.V.E.

N64-12032* National Research Corp., Cambridge, Mass.
INVESTIGATION OF ADHESION AND COHESION OF METALS IN ULTRAHIGH VACUUM Final Report, 1 Mar. 1963–1 Nov. 1963
John L. Ham 27 Nov. 1963 44 p refs
(NASA Contract NASw-734)
(NASA CR-52990) OTS: $4.60 ph, $1.52 mf

Apparatus was developed for the measurement of the force necessary to separate small specimens of metal cleaned and joined in ultrahigh vacuum. The frai ture-rejoin technique eliminates the surface cleaning problem and permits acquisition of data characteristic of the metal itself; it is not applicable to dissimilar metal pairs. Both similar and dissimilar combinations of the following metals at two hardness levels were studied—copper, copper-beryllium alloy, 1018 steel, 4140 steel, 440C steel, and titanium. The cleaning method used was wire brushing. Three runs (24 tests) were made with flat specimens and one run (8 tests) with chisel edge specimens. Cohesion occurred only between flat faced soft copper specimens wire brushed in vacuum. The cohesive force varied from 8 to 120 lbs after a compressive force of 2000 lbs and appeared to depend primarily on the thoroughness of wire brushing. Author

N64-12054 Washington U., Seattle Coll. of Engineering
A CLASS OF PERIODIC STRUCTURES EXCITED BY APERIODIC SOURCES
Rubens Adolpho Sigelmann and Akira Ishimaru Jun. 1963 177 p refs
(Contract AF 19(628)-2763)
(AFCRL-63-351; Tech. Rept. 77; AD-422709)

The object of this thesis is to study a class of periodic structures which have a periodically conducting slotted plane as one of the boundaries, when excited by a line source. This problem presents the difficulties which are characteristic to periodic structures excited by aperiodic sources. From the continuity of the fields in the slots, an infinite system of integral equations for the aperture fields is obtained. Under the assumption of narrow slots, the average of the electric and magnetic fields is related by expressions of the form of convolution. A sampling technique and a bilateral LaPlace transform permit obtaining a general formulation of this class of structures. The general formulation was applied to a particular structure—the periodically slotted plane separating an unbounded region from a grounded dielectric slab. Author

N64-12075 Mount Wilson Observatory, Pasadena, Calif.
ON THE ACCELERATION OF PARTICLES IN SHOCK FRONTS
E. Schatzman (Palomar Obs., Carnegie Inst. of Wash., Calif. Inst. of Tech., and Inst. d'Astrophys.) Repr. from Ann. Astrophys. (Paris), v. 26, no. 3, May–Jun. 1963 p 234–249 refs
(Contract AF 49(638)-21)
(AFOSR-2249; AD-423427)

Charged particles can be accelerated in a perpendicular magnetohydrodynamic shock wave. The scattering of particles by the heterogeneity of the magnetic field provides the statistical mechanism which is at the origin of the energy spectrum. The energies which can be obtained are quite high, even for weak shocks, but the stronger the shock, the larger the number of accelerated particles. It is possible to derive the energy spectrum, which obeys a power law deeply related to the nature of the heterogeneity which can be found in collision-free shocks. The conditions for acceleration (injection in the accelerating process) are the same as those for the existence of the heterogeneity in collision-free shocks. These results are applied to surface nuclear reactions and provide a good explanation of He^3 in 3 Cen A and Li in lithium stars. Author

N64-12080 ARO Inc., Arnold Air Force Station, Tenn.
A TECHNIQUE FOR MEASURING A LOCAL GAS DENSITY USING SCATTERED GAMMA RADIATION
J. B. Dicks (U. of Tennessee Space Inst.) and J. E. Shepard Arnold Eng. Develop. Center, Nov. 1963 42 p refs
(Contract AF 40(600)-1000)
(AEDC-TDR-63-187; AD-423150)

A method for direct density measurement of a gas without the use of material probes is proposed, and the experimental investigation summarized. The operation of the gas-density measuring instrument is based upon the interaction between a gamma-ray beam and the electrons in the gas, as described by the Compton scattering principle. Experimental results indicate the practicability of this instrument for use in low-density, high-temperature wind tunnels and other high-temperature gas flows such as rocket exhausts.
Author

N64-12088 Space Technology Labs., Inc., Redondo Beach, Calif.
PHOTOLUMINESCENCES OF BENZOYLACETONATES OF EUROPIUM AND OF SAMARIUM [ISSLEDOVANIE FOTOLYUMINESTSENTSII BENZOILATSETONATOV EVROPIYA I SAMARIYA]
A. N. Sevchenko and A. K. Trofimov Apr. 1963 18 p refs Transl. into ENGLISH of an article from Zh. Eksperim i Teor. Fiz. (Moscow), v. 21, no. 2, 1951 p 220–229
(STL-9990-6399-KU-000; STL-Transl.-75)

The absorption and emission spectra of solid state and solution compounds of benzoylacetonates of europium and samarium were investigated. It was determined that the absorption spectra do not have a discrete structure, and that the emission spectra are characteristic of the rare earths, and depend on the nature of the solvent and on temperature. It can be assumed that the excitation energy is absorbed by the organic fraction of the molecule, then transferred to the rare earth atom, which in turn transforms and radiates it in the form of the discrete emission lines. The laws of damping and quenching of the emission of europium benzoylacetonate were studied. It was demonstrated that the decrease in emitting efficiency of an organic europium compound in solution is accompanied by a simultaneous reduction of the damping constant. The degree of luminescence polarization of europium benzoylacetonate solutions was detected and measured quantitatively.
Author

N64-12106* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
FIELD EMISSION CHARGING OF METALLIC COLLOIDS
N. Stankiewicz Washington, NASA, Dec. 1963 27 p refs
(NASA TN D-2078) OTS: $0.75

With a free-electron model of metallic colloids, the charging time in an applied electric field is calculated for the alkali-group elements. A theoretical thin-wire ionizer is discussed with regard to required operating potentials, necessary geometrical dimensions, and current-density capabilities. Author

N64-12117 Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
MEASURED LATTICE PARAMETERS FOR NATURAL URANIUM METAL ROD LATTICES IN D_2O
T. J. Hurley, Jr. Aug. 1963 49 p refs
(Contract AT(07-2)-1)
(DP-777) OTS: $1.00

Nuclear parameters of sixteen D_2O-moderated lattices of natural uranium rod clusters were measured. The clusters consisted of 1, 3, 7, or 19 uranium metal rods. Each rod was 1 inch in diameter and was clad with 0.032 inch of aluminum. Triangular lattice spacings between clusters ranged from 7 to 21 inches, center to center. The parameters that were measured included the number of fission neutrons per thermal neutron absorption, η, the fast fission factor, ϵ, the resonance escape probability, p, the thermal utilization, f, and the thermal diffusion area, L^2.
Author

N64-12118 Oak Ridge National Lab., Tenn.
MEASUREMENT OF SPECTRAL DISTRIBUTION OF POSITRON FLUX IN AN INFINITE COPPER MEDIUM CONTAINING Cu^{64}
W. H. Wilkie and R. D. Birkhoff 24 Dec. 1963 24 p refs
(Contract W-7405-eng-26)
(ORNL-3469)

The spectral distribution of the flux of positrons inside a beta radioactive medium has been experimentally determined using an anthracene coincidence scintillation spectrometer. Positrons leaving a copper cavity source containing Cu^{64} were absorbed in a thin anthracene crystal. The light pulse from the anthracene was recorded in a 256 channel analyzer if a NaI scintillation spectrometer nearby recorded simultaneously a count under the total absorption peak for annihilation radiation. Thus discrimination against negative and secondary electrons was obtained which permitted observation of the primary positron slowing-down flux. Data were corrected for the nonlinear pulse height vs. energy relationship in anthracene by a semi-empirical theory due to Birks, the validity of which was demonstrated by its use in obtaining a linear Fermi plot of Pm^{147}. Positron spectra were corrected also for Compton absorption of the annihilation radiation in the anthracene. Results were compared with the theoretical continuous-slowing-down model. Over the energy range measured (20 to 650 kev) it was concluded that the continuous-slowing-down model gives the correct shape for the primary slowing-down spectrum.
Author

N64-12127* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
NMR DOUBLE RESONANCE TECHNIQUES FOR THE DETERMINATION OF RELATIVE SIGNS OF SPIN SPIN COUPLING CONSTANTS
D. D. Elleman and S. L. Manatt Oct. 1963 6 p refs Repr. from Magnetic and Electric Resonance and Relaxation, Proc. of the XIth Colloq. Ampere, Eindhoven, 1962 p 594–598
(NASA Contract NAS7-100)
(NASA-CR-55096; JPL-TR-32-266)

Double irradiation of high resolution NMR spectra makes it possible to determine the relative signs of some or all of the spin spin coupling constants. The technique has been used to determine the relative signs of not only proton proton coupling constants but also fluorine proton and fluorine fluorine coupling constants.
Author

N64-12130 Stanford U., Calif.
A STATISTICAL INTERPRETATION OF THERMODYNAMICS OF IRREVERSIBLE PROCESSES IN DILUTE GASES
Jean-Pierre Guiraud Sep. 1963 143 p refs
(Contract AF 49(638)-965)
(SUDAER-169)

This book is divided into two chapters. The first chapter deals with macroscopic equations, with special emphasis on the role of entropy in the analysis of dissipation processes and departure from equilibrium. The second chapter deals with the analysis of dissipation from a microscopic point of view. In each chapter, the investigation is carried out on three different levels of description: a simple monoatomic gas, and a mixture of monoatomic gases under two extreme situations.
R.T.K.

N64-12134 Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia)
ON THE MOBILITY OF THE H_3O+ ION IN ICE CRYSTALS
P. Gosar Jun. 1963 18 p refs
(NIJS-R-414)

The temperature dependent Green's function method is used for the calculation of the H_3O^+ ion mobility. The mobility is determined by a second order relaxation process which involves the emission of one phonon and the absorption of another. At this process one proton of the ion undergoes the virtual transition from the ground state to the excited vibrational state in the hydrogen bond. The calculated proton relaxation time is 3.10^{-12}s, and the theory accounts reasonably well for the experimental data. Author

N64-12137 European Atomic Energy Community, Brussels (Belgium)
RESULTS OF THE RADIOACTIVITY MEASUREMENTS IN THE COMMUNITY COUNTRIES FOR THE YEARS 1961-1962
Oct. 1962 159 p In GERMAN, FRENCH, ITALIAN, and DUTCH; abstracts in GERMAN, FRENCH, ITALIAN, DUTCH, and ENGLISH
(EUR-461.d,f,i,n) Available from the Belgian American Bank and Trust Co., N.Y., account No. 121.86: 210 Belg. Fr.

This document contains the results of the measurements made at a large number of posts responsible for the monitoring of background artificial radioactivity in the six Community countries. It is divided into three chapters dealing, respectively, with measurements of the air, fall-out, and surface waters for the years 1961 and 1962. There are graphs showing the trend, followed by the results at a number of typical posts. Author

N64-12148 Joint Publications Research Service, Washington, D.C.
ON THE SPECIAL FEATURES IN THE ELECTRON SPECTRUM OF SUPERCONDUCTING COMPOUNDS
I. B. Borovskiy 3 Jan. 1964 14 p refs Transl. into ENGLISH of an article from Tr. Inst. Met. im. A. A. Baikova, Akad. Nauk SSSR (Moscow), no. 15, 1963 p 79–87
(JPRS-22588; OTS-64-21197) OTS: $0.50

Research activities dealing with superconducting compounds are discussed and include the investigation of: (1) the fine structure of the X-ray absorption and emission spectra at room temperature for pure metals and compounds exhibiting superconductivity at low temperatures; (2) the electronic structure of the atoms of superconducting metals; and (3) the fine structure of the X-ray spectra of pure metals and compounds exhibiting superconductivity. P.V.E.

N64-12155* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ASTRORELATIVITY
Helmut G. L. Krause Washington, NASA, Jan. 1964 63 p refs
(NASA TR R-188) OTS: $1.75

The special theory of relativity is extended to the motion of bodies whose proper or rest mass is variable with time. Generalized relativistic conservation laws of momentum and total energy are derived and relativistic dynamics is applied to rocket propulsion and rocket motion. Einstein's general theory of relativity is applied to the motion of a satellite revolving in an arbitrary orbit around a rotating, nonhomogeneous, oblated spheroidal central body. This relativistic perturbation theory is an extension of the work of Einstein (1915), deSitter (1916), and of Lense and Thirring (1918). A formula for the relative difference of the time rates of a satellite clock, compared against a standard earth clock, (time dilatation effect and red shift) is derived for arbitrary orbits, thus extending the work of Winterberg (1955), Singer (1956), and Hoffmann (1957). Author

N64-12166 Argonne National Lab., Ill.
REACTOR DEVELOPMENT PROGRAM Progress Report, Nov. 1963
Albert V. Crewe 15 Dec. 1963 88 p refs
(Contract W-31-109-eng-38)
(ANL-6808)

Progress is reported in the following areas of research and development in magnetohydrodynamics (MHD): (1) MHD generator and cycle; (2) MHD power generation—jet pump cycle; and (3) MHD power generation—flashing cycle. Thermally regenerative electrochemical cells which, in a closed cycle, would have the net effect of converting heat from a nuclear reactor, or from some other source, into electricity are also being investigated. Two types of cells are being studied—the lithium hydride cell, and bimetallic cells. R.T.K.

N64-12168 Rice U., Houston, Tex.
MONTE CARLO CALCULATIONS FOR THE TWO-DIMENSIONAL TRIANGULAR LATTICE GAS: SUPERCRITICAL REGION
Dwayne A. Chesnut Repr. from J. Chem. Phys., v. 39, no. 8 15 Oct. 1963 p 2081–2084 refs Previously announced as a preprint
(NASA Grant NsG-6-59)

Detailed calculations have been carried out, using a Monte Carlo numerical procedure in a grand canonical ensemble, for the thermodynamic properties of a 10 × 10 triangular lattice gas model along six isotherms in the supercritical region. For each isotherm the thermodynamic properties are given at $\beta(\mu - 3\epsilon) = 0.0, -0.04, -0.20$, and -0.40, where μ is the chemical potential and ϵ is the nearest-neighbor interaction energy. Symmetry relations for calculating all the properties at the corresponding positive values of $\beta(\mu - 3\epsilon)$ are also given. Author

N64-12169 Aberdeen Proving Ground, Md. Ballistic Research Labs.
INITIAL HEATING RATES AND ENERGY INPUTS FOR EXPLODING WIRES
F. D. Bennett Aug. 1963 10 p refs
(BRL-MR-1506; AD-425374)

Equations for initial heating rate, resistance rise, power input and energy input for exploding wires are derived from elementary physical principles. The theory is expected to be valid for an interval beginning at switch-on and ending sometime before the wire expands. Comparisons are made between different wires, and pairs of elements are identified which may show similar explosion histories. Author

N64-12170 General Dynamics Corp., San Diego, Calif. John Jay Hopkins Lab. for Pure and Applied Sci.
MEASUREMENTS OF ATMOSPHERIC ION REACTIONS Yearly Technical Summary Report, 1 Aug. 1962-31 Jul. 1963
R. F. Stebbings and V. A. J. Van Lint 21 Nov. 1963 38 p refs
(Contract DA-49-146-XZ-041)
(GA-4431; DASA 1407; AD-424929)

A major emphasis was given to research in the following areas: (1) the study of ion-molecule reactions at higher than thermal energies using crossed-beam techniques; (2) the investigation of the charge shuffling processes which are operative at near thermal energies in the afterglows of RF discharges in certain gas mixtures; (3) the determination, through mass spectrometric techniques, of states of excitation of the neutral particles emerging from, and therefore present in, the decaying plasma in oxygen; the neutral oxygen emerging from a heated iridium furnace was similarly examined; and (4) microwave studies of recombination and attachment. Electron

collisions with atomic and molecular oxygen are also discussed. The production of positive and negative ions in electron collisions with atomic and molecular oxygen was examined through mass spectrometric monitoring of beams issuing from RF gas discharges and a thermal dissociation furnace. R.T.K.

N64-12178 Army Missile Command, Huntsville, Ala.
THE REFLECTION OF ELECTROMAGNETIC RADIATION; BASED ON CLASSICAL ELECTRODYNAMICS, VOLUME I
Herbert B. Holl 15 Mar. 1963 142 p refs
(RF-TR-63-4, vol. I, AD-422882)

These studies, based on classical electrodynamics, present numerical values of the Fresnel intensity reflection coefficients in tables and graphs. The reflection coefficients are given for normal and oblique incidence for approximately 2500 indices of refraction $N = n - ki$, i.e., $n = 0.1\ (0.1)\ 4.0$, $k = 0\ (0.1)\ 6.0$, for angles of incidence $H_0 = 0°\ (5°)\ 85°$. A set of graphs illustrate the solutions of the Fresnel equations. The supplementary remarks describe in detail the occurrence of reflection characteristics such as the angle of incidence H_0 for which (a) the amplitude of the wave oscillating parallel to the plane of incidence is a minimum, (b) the degree of polarization is a maximum, and (c) the two amplitudes of the reflected wave have a difference in phase of $\delta = 90°$. Tables and graphs illustrating these three special circumstances are provided. Some examples of the determination of the index of refraction from reflection measurements are also given. Author

N64-12185 Aerospace Corp., El Segundo, Calif. Labs. Div.
TRIPLET-TRIPLET ENERGY TRANSFER IN RIGID GLASSES: SOLVENT EFFECT
Seymour Siegel and Henry Judeikis 21 Nov. 1963 16 p refs
(Contract AF 04(695)-269)
(TDR-269(4240-30)-1; SSD-TDR-63-264; AD-424628)

Experiments were conducted to study the possible effects of the nature of the solvent in triplet-triplet energy transfer between aromatic molecules dissolved in rigid glasses. Electron paramagnetic and emission spectroscopy were used to monitor the energy transfer reactions. Results of the study indicate that the probability of triplet energy transfer is essentially independent of the solvent used, and further, that efficient transfer requires contact (overlap of electron densities) between donor and acceptor. Author

N64-12194 Air Force Cambridge Research Labs., Bedford, Mass.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF BACKSCATTERING FROM A CAVITY-LOADED MONOPOLE
Research Report
Werner W. Gerbes and William J. Kearns Aug. 1963 33 p
(AFCRL-63-355; AD-422863)

Backscattering from a monopole (linear scatterer) can be considerably diminished and almost suppressed if it is grounded in a cavity and the protruding length of the monopole does not exceed 0.45λ. The optimum depth of the cavity is about 0.25λ. The good agreement between theory and experiment justifies the rather bold theoretical assumptions made to avoid involved mathematics and implies their usefulness in similar problems. Author

N64-12196 Polytechnic Inst. of Brooklyn, N.Y.
DISPERSION RELATIONS IN TIME-SPACE PERIODIC MEDIA: PART 1-STABLE INTERACTIONS
E. S. Cassedy and A. A. Oliner 11 Feb. 1963 74 p refs
(Contract AF 19(604)-7499)
(PIBMRI-1122-63; AFCRL-63-334; AD-425589)

Complete dispersion characteristics are exhibited for electromagnetic waves propagating in a time-space periodically-modulated medium which is all-pass and dispersionless in the absence of the (pump) modulation. The dispersion relation is represented graphically in a form which is a generalization of the familiar one-dimensional Brillouin diagram for stationary periodic structures. From the repeated cell pattern it is ascertained that for this medium, only two types of interaction are possible: (1) stable interactions, of the stop-band type, associated with frequency conversion effects, and (2) potentially unstable interactions, characterized by a stop band in wavenumber rather than in frequency. These types of interaction occur, respectively, when the phase velocity of the pump modulation is less than or greater than that of a signal in the unmodulated medium. Separating these two types of interaction is a "sonic" region, which appears whenever these two phase velocities are approximately equal. The characteristics of the stable interactions and the sonic region are discussed in the present paper. Author

N64-12199 Emmanuel Coll., Boston, Mass. Research Language Center
THE INFLUENCE OF TEMPERATURE AND MAGNETIZATION IN SELECTIVE ABSORPTION AND FLUORESCENCE SPECTRA [DER EINFLUSS VON TEMPERATUR UND MAGNETISIERUNG BEI SELEKTIVEN ABSORPTIONS-UND FLUORESZENZSPEKTREN]
H. Du Bois and G. J. Elias Bedford, Mass., AFCRL, Feb. 1963 95 p refs Transl. into ENGLISH from Ann. der Phys., v. 27 (4), 1908 p 233–300
(Contract AF 19(604)-8505)
(E-T-G-63; AD-413002)

A hand spectroscope, a Raps spectrometer, a very high intensity autocollimator spectroscope, and a concave grid were used to observe and measure the absorption spectra of some colored gems, crystallized and microcrystalline substances, amorphous fused materials, and glassy solid solutions in an amorphous base substance—especially borax or glass. The simultaneous influence of temperature ana magnetization was given major consideration. Experimental results are given in tabular form. J.E.T.

N64-12203 Emmanuel Coll., Boston, Mass. Research Language Center
TENSION ENERGY [DIE SPANNUNGSENERGIE]
R. Becker and W. Doring Bedford, Mass., L. G. Hascom Fld., AFCRL, Jan. 1963 38 p refs Transl. into ENGLISH from the book "Ferromagnetismus", Chapter 11, Springer-Verlag, Chapter II, 1939 p 123–146
(Contract AF 19(604)-8505)
(E-T-G-63-12; AD-414746)

Various aspects of crystal tension energy are examined, including dependence of free energy upon distortions and direction of magnetization, the distortions for a given direction of magnetization and given tensions, and the determination of crystal tensile energy. J.E.T.

N64-12232 General Dynamics Corp., San Diego, Calif. John Jay Hopkins Lab. for Pure and Appl. Science
RESEARCH ON DELAYED GAMMA RAYS FROM FISSION Final Report, 1 Apr. 1962-1 Aug. 1963
R. B. Walton and R. E. Sund Kirtland AFB, N. Mex., AF Weapons Lab., Nov. 1963 45 p refs
(Contract AF 29(601)-5773; ARPA Order 307-62)
(RTD TDR-63-3072; GA-4525; AD-424395)

Absolute delayed gamma-ray intensities from the photofission of U^{238}, U^{235} and Th^{232} were measured as a function of time after bursts of fissions produced by the bombardment of samples with 20-Mev X-rays from an electron linear accelerator. For all three target nuclei, components of short-lived gamma rays contributed markedly to the gamma-ray activity for times up to 800μ sec after the beam pulse. Techniques were developed to use neutrons produced by the electron linear accelerator to investigate delayed gamma rays from neutron fission. Exploratory measurements on U^{235} (n, F) for times between 200 μsec and 30 msec after fission confirmed the existence and spectral composition of the isomeric component observed in photofission. Author

N64-12243 Army Missile Command, Huntsville, Ala.
DETERMINATION OF DIFFERENCES AND RATIOS OF SPECIFIC HEATS AND CHANGE IN ENTROPY AS APPLIED TO FIVE EQUATIONS OF STATE FOR GASES
Noah J. Hurst 15 Jul. 1963 44 p refs
(RS-TR-63-5; AD-423760)

Change in entropy and specific heats of gases are used in thermodynamics to evaluate properties of gases undergoing change of state such as flow properties behind shocks. Change of entropy is a logical starting point for this work, and where applicable properties are known at high temperatures these equations may be used. Steam was used for illustrative purposes because it is a well defined, thoroughly explored gas. The development of the equations precedes each equation in a logical, straightforward manner and ends with the desired properties in terms of known thermodynamic coordinates. Comparison of the calculated change in entropy is presented in bar-graph form for these equations of state for a real gas, superheated steam. A comparison of the difference in specific heats for these equations for the same gas is also given. In both the entropy change and the difference in specific heat, good agreement is found among the five equations of state. Author

N64-12257 Naval Radiological Defense Lab., San Francisco, Calif.
FRACTIONATION 3: ESTIMATION OF DEGREE OF FRACTIONATION AND RADIONUCLIDE PARTITION FOR NUCLEAR DEBRIS
E. C. Freiling 12 Sep. 1963 40 p refs
(Contract AT(49-7)-1963)
(USNRDL-TR-680; AD-423725)

This report presents a simplified, semitheoretical model of fractionation, suitable for making interim estimates of degree of fractionation and of radionuclide partition between local, intermediate, and worldwide fallout. The principles set forth are applicable to the treatment of air-, tower-, and surface-burst debris (in the order of decreasing confidence) and to correcting fallout-prediction systems for fractionation effects. Author

N64-12262 Naval Radiological Defense Lab., San Francisco, Calif.
THERMAL RADIATION AND FIRE EFFECTS OF NUCLEAR DETONATIONS
S. Martin and A. Broido (Agriculture Dept., Berkeley) 10 May 1963 47 p refs
(Contract MIPR-558-63)
(DASA-1376; USNRDL-TR-652; AD-422411)

Evidence is presented to show that, in a nuclear weapon attack on targets in urban and rural areas, thermal radiation and fire can be expected to make a major contribution to the destruction of life and property. The characteristics of the emitted thermal radiation, the radiant exposure as a function of distance, and the effects produced by this radiation are summarized. The formation, spread, and control of fires and possibilities for survival in fire zones are discussed. Fire countermeasures which might prove effective in reducing the extent of thermal damage are set forth. Author

N64-12273 University Coll. of Wales, Aberystwyth (Gt. Brit.) Edward Davies Chemical Lab.
SPECTROSCOPIC STUDIES: PART I, THE INFRA-RED SPECTRUM AND STRUCTURE OF SODIUM NITROMETHANE Technical Note No. 4
J. Yarwood and W. J. Orville-Thomas 30 Aug. 1963 16 p refs
(Contract AF 61(052)-691)
(AFCRL-63-757; AD-424088)

The infrared spectra of sodium nitromethane and nitromethane have been studied between 5000 and 250 cm^{-1}. Two possible models for the structure of the methanenitronate anion are considered, and it is shown that the frequency assignment favors the structure in which an atomic dipole is associated with the carbon atom. Author

N64-12277 Emmanuel Coll., Boston, Mass. Research Language Center
SEVERAL PROPERTIES OF VOCAL CORD VIBRATIONS OBSERVED FROM THE VIBRATION OF THE TRACHEAL OUTER WALL
S. Hiki and T. Sugimoto Mar. 1963 8 p refs Transl. into ENGLISH from Radio Commun. Res. Center, Meeting of the Acous. Soc. of Japan, 1961
(Contract AF 19(604)-8505)
(E-T-J-63-4; AD-424517)

Characteristics by which the vibrational wave patterns of the tracheal outer wall differ from those of the vocal sound-wave patterns are listed. Included in the list of characteristics are: (1) Vibrational wave patterns of the tracheal outer wall are clear wave patterns of the fundamental period (pitch period) of the vocal cord vibrations and are independent of the type of vowel. (2) The envelope of a wave pattern is smooth, and the change in the peak value of the wave pattern due to a vocal sound is slight. (3) No special change in the properties of the wave pattern is observed at the beginning and end of a vocal sound or the middle part and the beginning and end of a formant. (4) Vocal sound sources (consonant sound source, whispering sound) other than the vibrations of vocal cords have no effect at all on the vibrational wave patterns of the tracheal outer wall. P.V.E.

N64-12279 Emmanual Coll., Boston, Mass. Research Language Center
LINE EMISSION AND ABSORPTION OF CHROMIUM PHOSPHORS; PART 3 [DIE LINIENHAFTE EMISSION UND ABSORPTION DER CHROMPHOSPHORE 3]
Otto Deutschbein May 1963 25 p refs Transl. into ENGLISH of an article from Ann. Physik (Leipzig), v. 5, no. 20, 1934 p 828–842
(Contract AF 19(604)-8505)
(E-T-G-62-19; AD-412810)

The line emission and absorption spectra of chromium phosphors were investigated at temperatures lower than −195° C. A study was made of the Zeeman effect. The investigations indicated that the sharpness and positions of chromium phosphor lines do not change much within the temperature range from 78° C to 20° C or 14° C. This is explained by the fact that lattice vibrations, which determine the sharpness and

positions, are stable at 78° C thereby making any change impossible with a temperature decrease. However, the intensity ratios of some lines change quite considerably from 78° C to 20° C. In a magnetic field, the main lines and some of the secondary chromium phosphor lines examined are split. Splittings of the main lines have more components than the secondary lines; this leads to the conclusion that the main lines degenerate more strongly than do the secondary lines. C.L.W.

N64-12287 Air Force Cambridge Research Labs., Bedford, Mass.
AUTOMATED SPIN WAVE INSTABILITY THRESHOLD MEASUREMENT AND RECORDING
Tom G. Purnhagen Oct. 1963 32 p refs
(AFCRL-63-505; AD-423863)

A method for automatically plotting spin wave instability threshold data (butterfly curves) is described. The plotting system employs a servo loop to lock the power level of a microwave signal at the spin wave instability threshold level while the applied magnetic field is swept. Typical data obtained using this method are presented and compared with data taken manually. Detailed descriptions of all system components and selected photographs of the apparatus are included in the appendices. Author

N64-12294 Swiss Inst. of Meteorology, Locarno-Monti
ON THE BACKSCATTERING OF MIXTURES OF ICE AND WATER Technical Note No. 1
Jürg Joss and Roland List (Swiss Inst. for Snow and Avalanches) Sep. 1963 6 p Transl. into ENGLISH of a paper from J. Appl. Math. Phys., v. 14, 1963 p 376–380
(Contract AF 61(052)-559; Swiss Natl. Sci. Found. Grant 2071)
(AFCRL-63-760; AD-424125)

Measurements of the radar cross section of single ice–water mixtures were carried out. The cross section depends on the variation of the total liquid water content between 0% and 10%. Author

N64-12295 Stanford Research Inst., Menlo Park, Calif.
ON A POINTWISE VARIATIONAL PRINCIPLE OF ELASTICITY AND MATHEMATICAL PHYSICS Scientific Report No. 1
M. P. Stallybrass Nov. 1963 45 p refs
(Contract AF 19(628)-323)
(AFCRL-63-784; AD-424637)

A method is discussed for constructing stationary functionals for the solution of a linear boundary value problem, or of the derivatives of such a solution at a specified, but arbitrary, point. The procedure is applicable to any boundary value problem governed by a linearly elliptic partial differential equation, or a system of such equations, for which global fundamental solutions exist. The technique is particularly suited to obtaining approximate results in a class of mixed boundary value problems, involving a rigid body oscillating about various axes on the surface of an elastic half-space. The procedure is illustrated by constructing stationary expressions for the solution of a mixed boundary value problem associated with the Helmholtz equation and the class of elastodynamic problems referred to above. The method is applied to compute the displacement on the free surface of an elastic half-space due to the torsional oscillation of a finite disk situated on the surface. Author

N64-12298 Brandeis U., Waltham, Mass.
SHOCK RELATIONS IN A DENSE HIGH TEMPERATURE GAS Scientific Report No. 2
Ik-Ju Kang and Jack S. Goldstein 21 Mar. 1963 21 p refs
(Contract AF 19(604)-7283)
(AFCRL-63-898; AD-423694)

Shock relations are established for the dense high-temperature gas, ($\rho \approx 10^9$gr/cc, $T \approx 10^{9\circ}$ K), introducing relativistic concepts. It is assumed that the self-consistent static electric field does not play a significant role in the shock relations. From these relations, the heating effect due to the passage of the shock waves through a degenerate gas is deduced explicitly, indicating large heating effects. The results may be of significance in understanding the supernova phenomenon. Author

N64-12300 General Electric Co., Schenectady, N.Y.
RADIATION EFFECTS ON MICROWAVE DEVICES Final Report No. 8, 1 Jul. 1961–30 Jun. 1963
E. P. Plankis Ft. Monmouth, N. J., Army Electron. Res. and Develop. Labs. [1963] 206 p refs
(Contract DA-36-039-SC-87253)
(AD-423158)

The results of the literature search on copper, titanium, forsterite ceramics, magnetic materials, thoriated tungsten, insulators, cables, connectors, and electron vacuum tubes are discussed. Descriptions of the monitoring techniques and experimental procedures used for voltage-tunable magnetron parameters during a pulse of nuclear radiation are included. The results of the literature survey on materials used in traveling-wave tubes are given. A test procedure for monitoring traveling-wave tube dc and RF parameters during pulsed nuclear radiation is described. Author

N64-12313 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ABSORPTION OF GASES BY ACTIVE METALS
G. D. Glebov 13 Mar. 1963 19 p Transl. into ENGLISH of a book "Pogloshcheniye Gazov Aktivnymi Metallami", Moscow, Gosenergoiydat., 1961 p 157–173
(FDT-TT-62-1764/1+2; AD-415646) OTS: $1.60

Sorption of gases (hydrogen, nitrogen, and carbon) by niobium and tantalum is discussed. P.V.E.

N64-12314 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ELECTRICAL DISCHARGE IN WATER
N. V. Fillipov, V. V. Zhurin, and V. A. Sulyayev 27 May 1963 8 p refs Transl. into ENGLISH of an article from Inzh. Zh. (Moscow), v. 2, no. 4, 1962 p 341–342
(FTD-TT-63-385/1+2; AD-413808) OTS: $1.10

The destructive effect of a pulse discharge in liquid water (the electrohydraulic effect) on 60 × 60 × 60 mm concrete and 15 × 15 × 15 mm chalk specimens was investigated. The specimens, as well as the piezopickups, were located at distances of 50 and 100 mm along the axis of the discharge gap. Results indicate: (1) The amount of shattering of the specimens equated fairly well with the time of the pressure pulse multiplied by the speed of sound in the specimen. (2) The maximum pressure obtained at a distance of 100 mm, on the axis of the discharge gap, was about 1000 atm. (3) The brisance, which was noted, was controllable. I.v.L.

N64-12318 General Dynamics/Fort Worth, Tex.
INVESTIGATION OF ELECTRO-CHEMICAL PROPERTIES OF LIQUID AND FROZEN ELECTROLYTES AT LOW TEMPERATURES
H. J. Weltman 4 Nov. 1963 65 p refs
(Contract AF 33(657-11214)
(FGT-2917; AD-423614)

Electrical resistivities of electrolytes have been measured as a function of temperature from 25° to 196° C. The effects on these resistivities of varying the composition of the solvent, the composition of the solute, the concentration of the solute, and the rate of cooling the solution are presented. Structural studies of the frozen electrolytes by X-ray diffraction are included, and the results therefrom are correlated with the electrochemical behavior. Author

N64-12332 Wisconsin U., Madison
A MODEL FOR THE PRODUCTION OF SMALL EDDIES FROM LARGE ONES IN THE PRESENCE OF A MAGNETIC FIELD Technical Summary Report
P. C. Jain Sep. 1963 34 p refs
(Contract DA-11-022-ORD-2059)
(MRC-420; AD-424952)

In order to illustrate the process of grinding down of large eddies into smaller ones in the presence of a magnetic field in a turbulent flow mathematically, we have calculated this velevelopment with time of the motion of an infinite incompressible fluid when the initial motion is given by $u = A \sin ay$: $h_1 = B \sin by \sin bz$; $v = A \sin az$: $h_2 = 0$; $w = A \sin ax$: $h_3 = 0$. This model satisfies the conditions of being three dimensional and having a definite scale. Expressions for the mean square vorticity, kinetic energy and magnetic energy correct to third power of time have been calculated. These results have been investigated numerically. Curves have been drawn to show the behavior of mean square vorticity, kinetic energy, and magnetic energy, and their ratios with time at different Reynolds numbers and for different values of the initial magnetic energy. It is found that in the initial period of the magnetohydrodynamic turbulence, there is a transfer of energy from kinetic to magnetic. The presence of the magnetic field produces a faster decrease in the mean square vorticity as compared to the case when the magnetic field is weak or absent. Author

N64-12337 General Electric Co., Philadelphia, Pa. Missile and Space Div.
A FEASIBILITY STUDY OF THE MEASUREMENT OF ION DENSITIES BEHIND AIR SHOCKS BY INTRODUCING SMALL AMOUNTS OF LITHIUM VAPOR
B. Cary and W. Nickels Sep. 1963 50 p refs
(Contract AF 49(638)-1157)
(R63SD82; AD-423565)

The anomalous method was used to measure the amounts of lithium vapor injected into the shock-heated air, and it is concluded that concentrations of 300 ppm could be maintained within a factor of two. Experimental data are presented which suggest that the presence of the lithium vapor has no great effect upon either the vibrational relaxation rate of nitrogen or the overall dissociation rate of oxygen. Interferometric evidence indicated that the bulk dissociation processes did equilibrate behind M 18 shock waves in air although Stark measurements by the 4603A lithium line suggest that ionic equilibrium is not attained. Author

N64-12348 Chicago U., Ill. Inst. for the Study of Metals
THE HALL EFFECT IN LIQUID METALS
Bernard Springer (Ph. D. Thesis) [1963] 53 p refs
(Partially supported by NASA)

A liquid metal in which the unscreened electron–ion interaction is the sum of spherically symmetric terms is described. Using an exact expression for the conductivity tensor in a magnetic field, it is shown that the Hall constant R is given by a constant times the frequency derivative of the resistivity, evaluated at zero frequency and zero magnetic field. Effects due to quantization of the electronic levels in the field are ignored. The thecrem is then used to obtain an explicit theoretical expression for R in the form of a power series expansion in the pseudopotential. Calculation of R is done for Zn, and it is shown that the series converges slowly if at all. It is concluded that the small pseudopotential approximation is not convenient for and possibly not valid for dealing with electrical transport in liquid metals. Author

N64-12360 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THE QUESTION OF THE THEORETICAL CALCULATION OF SURFACE TENSION AND CERTAIN OTHER CHARACTERISTICS – SOLIDS AND LIQUIDS
M. Yu. Bal'shin 19 Aug. 1963 59 p Transl. into ENGLISH from Byul. Inst. Metallokeram. i Spetssplavov, 1959 p 5–37 refs
(FTD-TT-62-1831/1+2+4; AD-420852)

Various reasons for the difference in liquids and solids are examined, including bond energy and energy of formation of a free surface of a solid at 0 deg K; the criterion of the difference between the solid and liquid states; the critical state of a substance; calculation of surface tension; change of surface tension with temperature; boundary tension; and the deformation of liquids and solids. J.E.T.

N64-12374 Army Missile Command, Huntsville, Ala. Advanced Systems Lab.
THE REFLECTION OF ELECTROMAGNETIC RADIATION (BASED ON CLASSICAL ELECTRODYNAMICS), VOLUME II-APPENDIX: TABLES OF RADIATION REFLECTION FUNCTIONS
Herbert B. Holl 15 Mar. 1963 225 p
(RF-TR-63-4; AD-422882)

Numerical values of the Fresnel intensity reflection coefficients are presented in tables and graphs. Reflection coefficients are given for normal and oblique incidence for nearly 2500 indices of refraction. Author

N64-12382 Lockheed Missiles and Space Co., Sunnyvale, Calif.
STRUCTURAL STABILITY OF TOROIDAL SHELLS: AN ANNOTATED BIBLIOGRAPHY
Peter R. Stromer, comp. Jun. 1963 29 p refs
(Contract NOw 63-0050-C)
(LMSC-SB-63-50; AD-423823)

The toroidal shape is of particular interest in space applications as an optimum design for space vehicle liquid-storage containers, and for inflatable or collapsible structures. Torus designs have also been used by nuclear physicists to confine atomic fusion reactions in particle accelerators. Toroidal configurations are identified by their "donut" shape and have also been referred to as "anchor rings," "tore-shaped" shells, and in combination with spheres as torispherical shells. Both linear and nonlinear methods of stress analysis have been developed to study the structural stability of these shells; however, no reference to buckling behavior of toroids was located in this review of the literature covering the period January 1948 to June 1963. Author

N64-12387 Rochester U., N.Y.
REDUCED ENERGY SPREAD OF SYNCHROCYCLOTRON BEAMS
K. Gotow, K. F. Kinsey, F. Lobkowicz, M. E. Nordberg, N.W. Reay et al 8 Nov. 1963 9 p ref Submitted for Publication
(Contract AT(30-1)-875)
(UR-875-17)

Reduction of the energy spread of synchrocyclotron beams due to radial oscillations and target thickness is considered. The energy spread due to radial oscillations is eliminated by turning the radiofrequency off and using a moving target. By increasing vertical oscillations by utilizing a lip on the target, solid targeting is achieved and energy spread due to target thickness is reduced. C.L.W.

N64-12388 Rochester U., N.Y.
A NOTE ON THE CONSTRUCTION OF LIGHT PIPES
Neville W. Reay and Larry M. Preston 20 Nov. 1963 4 p refs
(Contract AT(30-1)-875)
(UR-875-18)

A flexible, light pipe coupling between photomultiplier tube and scintillator was devised. It consisted of a convoluted neoprene rubber tube coated on the inside with titanium oxide pigment in a vinyl base, and was filled with glycerine. The coating is elastic, allowing the tube to flex, and over periods of months does not peel from the rubber. The use of glycerine, which had essentially the same index of refraction as lucite, eliminated effects resulting from large discontinuities in indices of refraction along the light path. A comparison was made of the use of the flexible light pipe and that of a section of polished lucite. It was found that the flexible pipe attenuated the pulse height by a factor of two compared to the lucite pipe, but for bends up to 45°, a pulse height constant within about 5% was maintained. C.L.W.

N64-12395* Philco Corp., Blue Bell, Pa
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF MODULATION INDUCING RETRODIRECTIVE OPTICAL SYSTEMS Monthly Contract Progress Report No. 5, 21 Sep.-21 Oct. 1963
B. W. Harned and M. E. Lasser 28 Oct. 1963 7 p refs
(NASA Contract NASw-721)
(NASA CR-55076) OTS: $1.10 ph, $0.80 mf

The cross modulation of radiation beams has been demonstrated. The optical pumping model previously reported was incorporated in the newly constructed demonstration model. Resonance principles identical to those expected in transitions at optical frequencies are used in the cross beam which is a standard radio signal, rather than a second light beam. Construction of new light sources and an IF exciter allowed satisfactory stability of pumping, and lead to demonstration of cross modulation with two light beams. Cross-modulation frequency response is being investigated in terms of power level, modulation frequency, and index. Experimental investigation of the semiconductor band edge shifting technique has been started, and techniques for fabricating the materials at the doping levels and thicknesses required are being developed. Author

N64-12398* Brown U., Providence, R.I.
STRUCTURE OF ATOMICALLY CLEAN SURFACES OF REFRACTORY METALS Semiannual Status Report 2, 1 Apr. 1963-30 Sep. 1963
H. E. Farnsworth Oct. 1963 5 p refs
(NASA Grant NsG-373)
(NASA CR-52930) OTS: $1.10 ph, $0.80 mf

The structure of a surface cut parallel to a (110) plane in a tantalum single crystal has been studied as a function of heat treatment and ion bombardment for a limited range of conditions. The crystal was heated in the temperature range of 900° to 1100° C for 320 hours and ion bombarded for a total of 64 minutes. Conclusions from interpreted data are: (1) Ion bombardment and anneal do not measurably change the structure of the surface. (2) Heat treatment does change the structure of the surface. (3) The changes in surface structure are not reversible with temperature. J.E.T.

24 PHYSICS, PLASMA

Includes fusion; and magnetohydrodynamics. *For related information see*: 05 Astronomy and Astrophysics; 23 Physics, General; and 25 Physics, Solid-State.

N64-11440 ARO, Inc., Arnold Air Force Station, Tenn.
GASDYNAMIC DIAGNOSIS OF HIGH-SPEED FLOWS EXPANDED FROM PLASMA STATES
J. Leith Potter, George D. Arney, Jr., Max Kinslow, and William H. Carden Nov. 1963 51 p refs
(Contract AF 40(600)-1000)
(AEDC-TDR-63-241; AD-423983)

The report describes a number of methods of determining quantities which define the flow in low-density, hypersonic wind tunnels that use plasma generators to heat the working fluid. All of the methods considered may be classed as gasdynamic or aerodynamic as opposed to, say, spectroscopic methods. Measurements of total enthalpy, total and static pressure, and local mass flux are discussed, with descriptions of the equipment and typical results included. The emphasis is placed on procedures not requiring assumptions for the data reduction which cannot be checked. An appendix, containing an account of the effect on nozzle flow caused by one method of swirling gas injection into the plasma-generator electrode section, is also included. Author

N64-11448 Stevens Inst. of Tech., Hoboken, N.J.
OPERATION OF A COAXIAL PLASMA ACCELERATION Scientific Report No. 2
John E. Nankivell and Winston H. Bostick Oct. 1963 107 p refs
(Contract AF 19(604)-4086; Contract AT(30-1)-1921)
(SIT-P88; AFCRL-63-739; AD-422938)

The operation of an electrode-type coaxial plasma accelerator, with a large ratio of outer conductor radius to inner conductor radius, was experimentally investigated, and the results indicate that none of the usual models—slug, snowplow, and shock—correspond with the results. Hydrogen, helium, argon, and nitrogen were used, both by injection into the accelerator through a fast-acting valve and for uniform initial gas distribution. Results of current front position vs time are presented as functions of the various parameters. The shape of the leading surface of the current front was measured with probes, and the luminous plasma was photographed. Current distribution in the front was determined from magnetic probe measurements. Author

N64-11473 Princeton U., N.J. Plasma Physics Lab.
THE EFFECT OF COLLISIONS UPON PLASMA ION OSCILLATIONS
A. F. Kuckes Jun. 1963 30 p refs
(Contract AT(30-1)-1238)
(MATT-176)

The coupling between ion oscillations and electric currents introduced by collisional effects was studied. A growth of ion acoustic waves is found which extrapolates to the Vlasov gas value as the collision mean free path and wavelength become comparable. The damping of ion acoustic

waves is calculated from the fluid equations. For a plasma confined by a strong magnetic field, convective oscillations can be excited by an electron drift along the magnetic field lines. The growth rate and frequency of these oscillations is compared to stellarator experiments. Author

N64-11585 Princeton U., N.J. Plasma Physics Lab.
SCATTERING OF ELECTROMAGNETIC WAVES BY AN ELECTRON-PHONON SYSTEM
Amiram Ron May 1963 35 p refs
(Contract AT(30-1)-1238)
(MATT-201)

A theory is developed which describes the scattering of electromagnetic waves by the electron density fluctuation of an electron–phonon system. The frequency spectrum of the scattered radiation is calculated by the temperature-dependent Green's function method, and is alternatively derived by an elementary treatment in terms of dressed electrons and phonons. The resulting frequency spectrum of the scattered radiation shows resonances corresponding to the collective response of the electrons to the lattice vibrations, and to the collective excitation of plasma oscillations. Author

N64-11586 Princeton U., N.J. Plasma Physics Lab.
NORMAL MODES FOR ELECTROSTATIC ION WAVES IN AN INHOMOGENEOUS PLASMA
Francis F. Chen Oct. 1963 46 p refs
(Contract AT(30-1-1238)
(MATT-227)

The propagation of low-frequency electrostatic oscillations, perpendicular to a density gradient in a low-density, fully ionized plasma in a strong magnetic field B, is studied from the point of view of the linearized macroscopic equations. Two sets of waves are found in the limits where the electrons move freely along B, or not at all along B. Among these are waves which travel at the electron and ion diamagnetic drift velocities. A physical description of this phenomenon is given in terms of microscopic motions. The transition between these two sets of modes occurs at angles of propagation very close to 90° to B; to treat this region of angles one must take into account either the electron inertia or the plasma resistivity. Dispersion curves are given for this transition region. Author

N64-11644 Stanford Research Inst., Menlo Park, Calif.
ELECTROMAGNETIC SCATTERING FROM AN EXTENDED LAMINAR PLASMA COLUMN
H. S. Rothman Feb. 1963 65 p refs
(ARPA Contract SD-103; ARPA Order 281-62)
(Tech. Rept. 10; AD-402665)

This report is concerned with examining the backscattering from a simplified ionized target in the form of an extended laminar-plasma column. Since scattering from this model has been treated in the literature, the experimental results can be compared with the theoretical calculations to demonstrate the capabilities of the radar scattering system and the plasma diagnostic techniques. From a comparison of the experimental results and the calculated results which incorporate the measured electrical parameters of the column, it is shown that the accuracy to which the backscatter cross section can be determined is within ±1 db. Author

N64-11712 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
CONVERSION OF KINETIC ENERGY OF A STATIONARY PLASMA STREAM INTO ELECTRICITY WITH ISOTHERMAL RETARDATION OF THE STREAM IN A TRANSVERSE MAGNETIC FIELD
V. M. Sarychev *In its* J. of Appl. Mech. and Tech. Phys. Selected Articles 3 May 1963 p 1–7 refs Transl. into ENGLISH of an article from Zh. Prik. Mekhan. i Tekhn. Fiz. (Moscow), no. 2, 1962 (See N64-11711 03-01) OTS: $6.60

The flow of a plasma in a magnetohydrodynamic generator with a plasma temperature constant along the channel is investigated mathematically. Systems of equations are developed for isothermal motion of a one-dimensional stream of compressible nonviscous fluid with finite conductivity in a planar channel of arbitrary rectangular cross section through a transverse magnetic field. The channel walls parallel to the magnetic field are electrodes which make it possible for a potential difference that alternates along the length of the channel to be formed on them (sectionalized electrodes, separated by insulators). Optimal retardation of the plasma stream, retardation of the plasma in a channel with constant expansion angle, and retardation of a plasma in a homogeneous magnetic field with the potential difference on the wall-electrodes of the channels constant along the length of the channel are also considered. P.V.E.

N64-11713 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
GENERATION OF ELECTRIC CURRENT BY A PLASMA FLOWING IN A TUBE
E. I. Andriankin *In its* J. of Appl. Mech. and Tech. Phys. Selected Articles 3 May 1963 p 8–18 b refs Transl. into ENGLISH of an article from Zh. Prik. Mekhan. i Tekhn. Fiz. (Moscow), no. 2, 1962 (See N64-11711 03-01) OTS: $6.60

The electric efficiency of a generator, with conductivity corresponding to a mixture of nitrogen and 1% potassium vapor, is calculated. Interpolation formulas for dependence of the conductivity on the pressure and temperature are used in the calculations. The presence of friction against the tube walls influences, in some cases, the flow of the plasma and is taken into account in analysis of the efficiency. Several factors were disregarded in the analysis: the anisotropy of the conductivity, the terminal losses at the closed points, the heat dissipation of the walls, and the losses to electric resistance in the near-electrode boundary layer. The calculations indicate that, for cases of practical interest, the subsonic modes are more advantageous than the supersonic modes. In the case of flow with constant conductivity without friction, the maximum efficiency was calculated to be 17%. P.V.E.

N64-11714 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THERMAL IONIZATION AND ELECTRIC CONDUCTIVITY OF SOME COMBUSTION MIXTURES AND PRODUCTS
G. S. Aravin and V. P. Shevelev *In its* Appl. Mech. and Tech. Phys. Selected Articles 3 May 1963 p 19–38d refs Transl. into ENGLISH of an article from Zh. Prik. Mekhan. i Tekhn. Fiz. (Moscow), no. 3, 1962 (See N64-11711 03-01) OTS: $6.60

On the basis of the thermal nature of ionization (the Saha equation), a calculation is made of the electron concentration and electric conductivity of various inert gases (argon, nitrogen, helium) with additives of the most easily ionized substances (cesium, potassium, sodium) in the temperature range 1500° to 4000° K, and also of the combustion products of some gaseous highly calorific fuels containing the same additives at atmospheric pressure. The dependence of the

electric conductivity of the mixture on the temperature, pressure, type of gas, and amount of additive is analyzed. The calculation is made without account of the influence of the electric and magnetic fields on the concentration of the electrons and on the electric conductivity. The calculation data must be regarded as approximate. Author

N64-11791* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
NONEQUILIBRIUM EXPANSION OF A PLASMA FROM A THERMIONIC SOURCE
Peter M. Sockol Washington, NASA Dec. 1963 19 p refs
(NASA TN D-2086) OTS: $0.50

The nonequilibrium expansion of a partially ionized gas through a convergent–divergent nozzle is analyzed with a three-body recombination coefficient. The results of calculations for alkali metal plasmas, such as might be produced in a thermionic diode, are presented. They indicate that a large percentage of the ionization energy can be recovered before freezing becomes dominant. In particular, for lithium initially 60-percent ionized at 10 millimeters of mercury, 0.789 of the available thrust and a specific impulse of 960 seconds were obtained. Author

N64-11820* Advanced Kinetics, Inc., Costa Mesa, Calif.
LABORATORY SIMULATION STUDIES OF OUTER SPACE PHENOMENA Second Quarterly Status Report, 15 Jul.–15 Oct. 1963
R. S. Lowder et al 15 Oct. 1963 28 p
(NASA Contract NASw-702)
(NASA CR-52909) OTS: $2.60 ph, $1.04 mf

Major emphasis was placed on the development of Langmuir probe diagnostics for the study of a high-speed plasma impinging upon a three-dimensional magnetic dipole. A system of ten Langmuir probes was constructed and placed in the region of the plasma-field interaction. These probes made possible the simultaneous observation of the plasma at ten different positions with no observable "cross-talk" between the probe signals. Also, a single probe was placed at various points along the dipole plasma gun line. This probe, lying in the equatorial plane of the dipole, was usea to measure the density of the plasma, the plasma potential, and the temperature. It was also possible to determine the position of the boundary of the cavity formed when the plasma impinges upon the magnetic dipole. In addition, further image-converter photographs were taken simultaneously with the probe observations. Photographs looking perpendicular to the dipole axis were also taken. Furthermore, magnetic probe measurements of the increase in the magnetic field due to the surface currents in the field-plasma boundary were made. I.v.L.

N64-11889* Case Inst. of Tech., Cleveland, Ohio
A STUDY OF CURRENT SHEETS IN A COAXIAL PLASMA GUN
Masud Naraghi Jun. 1963 92 p refs
(Supported by NASA and Cambridge AF Res. Center)
(NASA CR-55018; TR-A-22) OTS: $8.60 ph, $2.96 mf

An experimental study of the dynamics and the structure of current sheets in a coaxial plasma gun has been made. The gun has an aspect ratio of two, uniform gas distribution with no preionization, and no auxiliary magnetic field. It is observed that only a small range of pressures will produce a plane, symmetrical current sheet. It is found that although the total current delivered to the gun is time varying, the sheet conducts a constant current for a relatively long period. A modified snow plow model gives an adequate explanation of the stabilized velocity. Comparison to a shock model and a free particle model is also given. A novel method of electron temperature measurement by using the resistivity of the sheet is utilized. Author

N64-11900* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CALCULATED RADIO ATTENUATION DUE TO PLASMA SHEATH ON HYPERSONIC BLUNT-NOSED CONE
John S. Evans and Paul W. Huber Washington, NASA, Dec. 1963 32 p refs
(NASA-TN-D-2043) OTS: $0.75

Electron concentration and collision frequency were evaluated at several axial flow stations along a blunt-nosed 9° half-angle cone flying at zero angle-of-attack, 17,700 fps, and 170,000-ft altitude. These conditions were chosen to correspond to those for the maximum observed attenuation during the flight of the RAM A1 vehicle. Equilibrium, frozen, and finite-rate flow assumptions were made about both chemical and ionic processes. Boundary-layer concepts were applied to modify the results near the body. Signal attenuation at 240 Mc was computed by numerical integration through the plasma layer of the propagation equation for electromagnetic radiation. The propagation model was a monochromatic plane wave, normally incident on a plane-parallel plasma, in which electron concentration and collision frequency varied only in the propagation direction. Author

N64-11961 Utah U., Salt Lake City Microwave Devices Lab.
CHARACTERISTICS OF A MERCURY-ARC DISCHARGE IN A MAGNETIC FIELD Technical Report NSF-5
Verle A. Gilson and Curtis C. Johnson Aug. 1963 74 p refs
(NSF Grants G-15017 and GP-843)

The following topics are included: (1) plasma measurement techniques—Langmuir double probes and resonant cavity; (2) a description of discharge tubes and cavities; and (3) experimental data and discussion—laboratory procedure for testing the tubes, electron temperature, plasma density, mercury pool, and room-temperature effect, tube envelope temperature, and low-frequency oscillations. R.T.K.

N64-12019 Brandeis U., Waltham, Mass. Brandeis Astrophysics Inst.
SMALL AMPLITUDE WAVES AND SCREENING IN DENSE DEGENERATE PLASMA Scientific Report No. 3
Jack S. Goldstein 24 May 1963 34 p refs
(Contract AF 19(604)-7283)
(AFCRL-63-899; AD-424129)

The propagation of electro-acoustic waves in a dense degenerate plasma is considered, for the density range 10^{-6}–10^{-9} g/cc and at temperatures up to 10^{8}–10^{9} °K. Appropriate dispersion relations are obtained for longitudinal and transverse waves, including the effect of the ion gas. Author

N64-12043 Air Force Cambridge Research Labs., Bedford, Mass. Upper Atmosphere Lab.
THE HYDROMAGNETIC WAVE TUBE
Randall E. Murphy and Marshall H. Bruce Nov. 1963 24 p refs
(Instrumentation for Geophys. and Astrophys. no. 30; AFCRL-63-779; AD-424939)

An experimental study of the production of magnetohydrodynamic waves was undertaken. The purpose of this investigation is to experimentally answer the questions of energy coupling and modes of propagation, and to explore the

possibility of cross modulation between electromagnetic and hydromagnetic waves. A laboratory device, called the hydromagnetic wave tube, was constructed to accomplish this program. This report outlines the physical construction of this device, and presents a theoretical analysis of the anticipated ionization characteristics. Author

N64-12089 Princeton U., N.J. Plasma Physics Lab.
AN IMPROVED QUIESCENT PLASMA SOURCE
Nathan Rynn Aug. 1963 33 p refs
(Contract AT (30-1)-1238)
(MATT-219)

The Q-1 device, a fully ionized plasma source, is described and discussed. This device utilizes the principle of contact ionization of cesium on hot tungsten, and since its conception many improvements and modifications have been made. The theory of the device is presented in a simple form, and components of the device, the ovens, collimators, hot plates, the vacuum vessel, the solenoid, auxiliary equipment, and diagnostics, are discussed. C.L.W.

N64-12136 Innsbruck U. (Austria) Inst. for Theoretical Physics
THE PRESSURE HILL AND THE ADIABATIC ELLIPSE IN MAGNETOGASDYNAMICS Technical Note No. 3
Ferdinand Cap and R. Skarics 25 Jul. 1963 12 p refs Submitted for Publication
(Contract AF 61(052)-675)

On the basis of Bernoulli's equations for a potential flow in magnetogasdynamics, a modified Saint-Venant–Wantzel formula of efflux is derived. Pressure as a function of the velocity of efflux is calculated for magnetic field strengths of 0, 5,000, and 10,000 Gauss. The equation of a modified adiabatic ellipse is deduced with the aid of an auxiliary quantity for calculation, closely based on gasdynamics. Furthermore, expressions interrelating the flow velocity, the modified Mach number, and the modified critical Mach number, are studied. Author

N64-12193 University of Southern Calif., Los Angeles
ELECTROMAGNETIC RADIATION THROUGH A COLD CYLINDRICAL PLASMA SHEATH WITH AN AXIAL STATIC MAGNETIC FIELD
Cavour W. H. Yeh Aug. 1963 29 p refs
(Contract AF 19(604)-6195)
(AFCRL-63-347, USCEC-82-214; EE-30; AD-423426)

Expressions are obtained for the radiated fields of an arbitrary slot on a conducting cylinder coated with a cold plasma sheath with an axial static magnetic field. It is well-known from the plane-wave analysis that the presence of a static magnetic field affects considerably the transmission characteristics of the signal through the plasma sheath. This paper considers the effects of a static magnetic field on the radiation pattern of a plasma-coated slot antenna. Extensive numerical computations are carried out for the special case of an infinite axial slot. It is found that if the plasma frequency is moderate a small axial static magnetic field could change significantly the radiation patterns of the slotted antenna. Furthermore, due to the anisotropy of the plasma medium, the radiation patterns are asymmetric. Author

N64-12197 Brown U., Providence, R.I.
PLASMA ELECTRON TEMPERATURE IN A STRONG INHOMOGENEOUS ELECTRIC FIELD
Harry M. Cronson and Lewis Wetzel June. 1963 101 p refs
(Contract AF 19(628)-2498)
(AFCRL-63-377; AD-422962)

Steady state transport equations, based on kinetic theory, which admit elevated, spatially varying, electron temperatures; density gradients; and induced electric fields are constructed for both a weakly ionized and strongly ionized gas in a strong electric field. The physical meaning of these equations is discussed. They are then applied to determine the effect of a prescribed, strong standing wave on an initially homogeneous plasma. Here two modes of behavior are distinguishable. In the low frequency case the electron temperature "follows" the field and the electron temperature and electron and ion density show strong spatial dependence. The induced field linking the electrons and ions is relatively strong. In the second high frequency mode the electron temperature establishes itself around some mean value with small spatial perturbations. For this case, density gradients and the induced field are negligible. Author

N64-12209 Michigan U., Ann Arbor
MICROWAVE PLASMA COMPONENTS STUDY
Andrejs Olte and E. K. Miller Griffiss AFB, N.Y., Techniques Lab., Nov. 1963 28 p refs
(Contract AF 30(602)-2605)
(RADC-TDR-63-435; AD-424721)

First-order theory is presented for a magnetoplasma resonance isolator employing the TM_{11} mode in a rectangular waveguide. The effect of nonuniform magnetostatic field on the nonreciprocal transmission properties of the device is investigated. The beginning of experimental study to improve the stability of plasma package in the microwave circuit application is presented. Author

N64-12250 Avco-Everett Research Lab., Everett, Mass.
A TECHNIQUE FOR MEASURING THE ELECTRICAL CONDUCTIVITY OF WAKES OF PROJECTILES AT HYPERSONIC SPEEDS
H. E. Koritz and J. C. Keck Sep. 1963 23 p refs
(Contracts AF 04(694)-33 and DA-19-020-AMC-0210; Proj. Defender)
(BSD-TDR-63-201; Avco-Everett Res. Rept.-167; AD-425619)

A technique is described for measuring the electrical conductivity of hypersonic wakes and any conducting medium by measurement of the Joule losses produced by the oscillating magnetic field of a circular coil surrounding it. The apparatus consists of a symmetrical R. F. bridge, two arms of which contain identical coils. A conducting medium inserted into one of the coils unbalances the bridge, changing the apparent impedance of the coil. Although the apparatus was designed specifically to investigate the conductivity of hypersonic wakes, it has also been used to measure the conductivity of electrolytic solutions, electrical discharges, flames, and plasmas produced in shock tubes. The measurements on electrolytic solutions gave results in satisfactory agreement with their known conductivities and provided a convenient check on the calibration of the apparatus. The shock-tube measurements were made in air and agreed well with the results of Lamb and Lin. Results of the measurements of the conductivity of electrolytic solutions, shock-tube heated plasmas, and hypersonic wakes of 0.22-in.-diameter nylon spheres in argon are presented. Author

N64-12394* Electromagnetic Research Corp., College Park, Md.
THE PLASMA SHEATH IN A MAGNETIZED PLASMA Interim Report
Woodward W. Zachary 17 Aug. 1962 20 p refs
(NASA Contract NAS5-585)
(NASA CR-55100; NAS-585-5) OTS: $1.60 ph, $0.80 mf

Equations are derived for determining the properties of the plasma sheath (particularly the particle density and potential distributions) formed about vehicles moving through the ionosphere. Derivation begins with a generalization of the method used by Kadomtsev and Ichikawa (the use of a variant of Bogoliubov's method to derive a Fokker–Planck equation containing spatial dependent effects in the collision terms) to fit the case of a nonneutral two-component plasma in the presence of a static magnetic field. Methods for solving the derived equations are presented, and a theoretical derivation of the dependence of the sheath thickness on the medium parameters is discussed. I.v.L.

N64-12401* Electromagnetic Research Corp., College Park, Md.
THE THEORY OF THE CONDUCTIVITY PROBE Memorandum Report
W. W. Zachary 15 Jun. 1963 10 p refs
(NASA Contract NAS5-585)
(NASA CR-55101; NAS-585-8) OTS: $1.10 ph, $0.80 mf

Preliminary results are discussed which have been obtained in an attempt to improve upon the theory of the conductivity probe. Included is a summary of the existing theory. Remarks are made concerning the analysis which produced the existing theory, and an expression is sought for the conductivity of ions scattering against neutral particles with no restriction on the relative sizes of the masses of the two particles. It was concluded that the existing theory of the conductivity probe is not adequate for the present problem. The condition is given that, when particles of comparable mass are colliding, account must be taken of the types of particle orbits which occur. The existing theory does not contain enough detail for this purpose. C.L.W.

25 PHYSICS, SOLID-STATE

Includes semiconductor theory; and masers. *For related information see*: 09 Electronics; 23 Physics, General; and 24 Physics, Plasma.

N64-11459 Dayton U., Ohio Research Inst.
MICRO-X-RAY DIFFRACTION OF WHISKERS [Final Report, 1 Feb. 1962-1 Feb. 1963]
Werner R. Rambauske and Ronald R. Gruenzel Wright-Patterson AFB, Ohio, AF Materials Lab., Jul. 1963 35 p refs
(Contract AF 33(616)-8416)
(ASD-TDR-63-643; AD-422382)

Whiskers grown from ferrous chloride in an atmosphere of argon with 1% contamination of hydrogen are investigated by Laue X-ray diffraction. A new type microsize collimator and mount were built for this purpose and are described. The high resolution achieved in the diffractogram indicates screw-like lattice orientation over the length of the whiskers. It has been discovered that a whisker of the type referred to above contains face-centered cubic structures. Analysis and calculations are given. Author

N64-11527 Joint Publications Research Service, Washington, D.C.
RELATIONSHIP OF THE NUMBER OF DEFECTS IN SINGLE CRYSTALS TO THE DIRECTION OF IRRADIATION
M. V. Fedulov *In its* Transl. from Fiz. Metal. i Metalloved. 13 Feb. 1962 p 6–17 refs (See N64-11525 03-01) OTS: $0.75

The problem of the relationship of the number of defects in single crystals to the direction of irradiation with electrons and gamma quanta near the threshold is considered. Approximation formulas are derived, and calculations are carried out which show considerable probability of the formation of a Frenkel pair, by an electron, during angular asymmetric irradiation of a single copper crystal. I.v.L.

N64-11528 Joint Publications Research Service, Washington, D.C.
MECHANISM OF TWINNING IN THE DEFORMATION OF SINGLE CRYSTALS OF A MO-35% Re ALLOY
Ye. M. Savitskiy and Tao Tsu-ts'ung *In its* Transl. from Fiz. Metal. i Metalloved 13 Feb. 1962 p 18–24 refs (See N64-11525 03-01) OTS: $0.75

The crystallography of twinning of single crystals of Mo-35 a/o Re during stretching at room temperature was investigated. For the determination of the crystallographic mechanism of deformation, a study was made of the twinning tracks on the surface of the crystals by microscopic examination and by the X-ray method. Results include the following: (1) The stress-deformation curve showed that twins were formed on stretching. When twinning takes place the curve acquires a serrated configuration and, at the same time, characteristic crackling is heard. Breakup of the single crystal takes place after a 7.5% elongation and occurs by spalling. The stress at rupture is 65 kg/mm^2. (2) The twins of Mo-35 a/o Re are formed on plane (112) by slip in the direction of [111] which is located within the plane of twinning. Such a crystallography coincides with the system of twinning of other metals having a body-centered cubic lattice. I.v.L.

N64-11563* National Aeronautics and Space Administration, Washington, D.C.
THE SURFACE ENERGY OF CERTAIN OXIDES, SULFIDES AND SELENIDES [POVERKHNOSTNAYA ENERGIYA NEKOTORYKH OKISLOV, SUL'FIDOV I SELENIDOV]
S. N. Zadumkin and V. Kh. Khulamkhanov Dec. 1963 7 p refs Transl. into ENGLISH of an article from Izv. Vysshikh Uchebn. Zavedenii, Fiz. (Tomsk), no. 4, 1962 p 112–114
(NASA TT F-167) OTS: $0.50

An approximation method is used to evaluate the surface energy of compounds which have a considerable weight of ionic bond ($M^2 + X^{2-}$), and a structure of the NaCl or wurtzite type. Author

N64-11588 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
CREATION OF A PHOTOACTIVE SURFACE ON PbS CRYSTALS AND STUDY OF THE PHOTOEFFECT MECHANISM ON IT
L. N. Syrnev 4 Dec. 1962 7 p refs Transl. into ENGLISH of an article from Compt. Rend. Acad. Bulgare Sci. (Sofia), v. 13, no. 3, 1960 p 269–272
(FTD-TT-62-1517; AD-294504)

An effort to create a photoactive surface of PbS monocrystals, having electron conduction but no photoproperties (photoconductivity and photo-EMF) at the point of metallic contact, is described. Also investigated was the effect of the metal, used as the point contact, on the magnitude of the photo-EMF effect. No difference was obtained in use of iron, copper, aluminum, tungsten, manganin, constantan, and phosphor bronze. The sign of the photo-EMF (upon illumination, the metal becomes negatively charged) indicted that the surfaces are covered by positive ions (probably PbO^{++}). P.V.E.

N64-11630 Rice U., Houston, Tex.
DISLOCATION RELAXATION PEAKS IN F.C.C. METALS AFTER DEFORMATION AT 4.2°K
Shigeo Okuda Repr. from Sci. Papers of the Inst. of Phys. and Chem. Res. (Tokyo), v. 57, no. 3, Sep. 1963 p 116–134 refs
(NASA Grant NsG-6-59)

The internal friction and dynamic modulus of gold, copper, silver and platinum are measured in the temperature range from 4.2° to 300° K after deformation at 4.2° K and subsequent low-temperature annealing. The Niblett–Wilks and Bordoni peaks observed on gold and copper immediately after deformation at 4.2° K show a pronounced reduction in height after annealing around 180° K. These peaks regrow on room-temperature annealing. A detailed study is made on gold during low-temperature annealing. The Bordoni peaks in silver and platinum behave somewhat differently from those in gold and copper. These results are discussed in relation with the so-called annealing stages observed after irradiation or cold work. Author

N64-11733* Ohio State U., Research Foundation, Columbus Antenna Lab.
LASER MATERIALS: A TUTORIAL REVIEW WITH BIBLIOGRAPHY
James E. Bradley 1 May 1963 298 p refs
(NASA Grant NsG-74-60)
(NASA CR-52903; Rept. 1093-17) OTS: $18.50 ph, $9.14 mf

A basic and tutorial paper, dealing with the nature of crystals and glasses, and to a lesser extent with some of the possible laser ions is presented. Also included is a bibliography, in part annotated, containing standard references and data sources as well as specific articles dealing with a variety of subjects related to crystals, glasses, spectra, and other subjects related to laser materials. Author

N64-11911 Atomics International, Canoga Park, Calif.
DIFFUSION KINETICS STUDIES IN THE Al-Ni-U SYSTEM
R. A. Harlow and Otto Gamba 30 Nov. 1963 35 p refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-8387) OTS: $0.75

A diffusion couple technique was developed and standardized for the purpose of obtaining meaningful data regarding the diffusion kinetics of the Al-Ni-U system. In addition, the nickel barrier bond between Type 1100 aluminum cladding and cast U–3.5%Mo fuel alloy was metallographically examined on four fuel cylinders fabricated according to Piqua procedure. The following conclusions were obtained: (1) the penetration of aluminum into nickel followed a parabolic relationship with time; (2) the nickel penetration data generated by the diffusion couple technique were slightly higher than those derived from the cylinder bond study; (3) a low-aluminum phase AlNi or $AlNi_3$ nucleated at the Al_3Ni/Al_3Ni_2 interface when the supply of additional free Al into the system was restricted due to void formation or separation between intermetallics and Al; (4) the interdiffusion rate of uranium and nickel also followed the parabolic relationship with time. Author

N64-11933 Motorola, Inc., Phoenix, Ariz.
RESEARCH AND DEVELOPMENT FOR SURFACE PROTECTION FOR SILICON DEVICES Scientific Report No. 4, 15 Dec. 1962-14 Mar. 1963
S. S. Flaschen, H. W. Cooper, H. C. Evitts, M. A. Hall, and J. La Brie 1963 27 p
(Contract AF 19(604)-8358)
(AFCRL 63-333; AD-422580) OTS: $2.60

Work during the reporting period was directed toward the electrical evaluation of passivating layers. Equipment for both ac and dc evaluation is discussed. Also, grown silicon dioxide films on germanium and gallium arsenide surfaces by a sputtering process are reported on. The sputtering process is described, and the apparatus is diagramed. Author

N64-11936 Emmanuel Coll., Boston, Mass. Research Language Center
APPLICATION OF THE PHOTOVOLTAIC EFFECT IN THE STUDY OF THE HOMOGENEITY OF GERMANIUM [ZASTOSOWANIE ZJAWISKA FOTOWOLTAIC-ZNEGO DO BADANIA JEDNORODNOSCI GERMANU]
J. Swiderski L. G. Hanscom Field, Mass. AF Cambridge Res. Labs. [Jan. 1963] 49 p refs Transl. into ENGLISH of an article from Arch. Elektrotech. (Warsaw), v. 10, no. 2, 1961 p 441–467
(Contract AF 19(604)-8505)
(E-T-P-63-1; AD-411114)

This work describes a method of studying the homogeneity of germanium by measuring the volumetric photoelectromotive force. It presents the mathematical formulas derived by Tauc, as well as by Laszkariew and Romanov, and analyzes the limits of their application. It also discusses the measuring equipment used, as well as a number of practical examples of the study of the homogeneity of germanium monocrystals and several samples of germanium used to study the structure of the elements. Author

N64-12035 Massachusetts Inst., of Tech., Cambridge
X-RAY STUDY OF ORDER-DISORDER IN ALLOYS Final Report, Jul. 1948–Jul. 1962
B. E. Warren Sep. 1963 5 p refs
(Contract Nonr-1841(36))
(AD-422006)

Reliable quantitative measurements of long-range order and short-range order in representative order–disorder systems were made. Order measurements were made on the classical alloys Cu_3Au, CuAu, $CuAu_3$, CuPt, AgAu, CuZn, and AgZn. Developments were made in both the experimental techniques and the theory required for interpretation. A list is included of the 27 published reports containing technical information resulting from the project. R.T.K.

N64-12036 Air Force Systems Command, Wright-Patterson AFB, Ohio Air Force Materials Lab.
THE DEBYE CHARACTERISTIC TEMPERATURE OF SOLIDS
F. W. Vahldiek and A. M. Vahldiek Sept. 1963 23 p refs
(ASD-TDR-63-881; AD-422458)

The Debye characteristic temperature as derived from Einstein's equipartition law is compared with frequency distribution functions of Born, Blackman, and Lindemann. Debye θ values determined by mechanical and thermodynamic measurements for the rather simple elemental solids show differences. The following methods for deriving the Debye characteristic temperature for solids are discussed: specific heat, electrical resistance, X-ray diffraction, high pressure, mechanical, and infrared. Debye temperature measurements for certain anisotropic and refractory solids such as SiO_2, TiO_2, and graphite have been included. An attempt was made to calculate the "average" Debye θ for ZrO_2 and HfO_2. Author

N64-12051 Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
THE THERMAL DECOMPOSITION OF GALLIUM ARSENIDE
M. F. Millea and D. F. Kyser 23 Oct. 1963 47 p refs
(Contract AF 04(695)-269)
(TDR-269(4250-11)-1; SSD-TDR-63-257; AD-425028)

Thermal decomposition of single crystals of GaAs between 750° and 950° C has been investigated. When a single crystal of GaAs is sealed in a quartz tube with pure gallium and maintained at a high temperature, a relatively small degree of decomposition occurs. Under these conditions, decomposition pits made up of {111} planes are formed. Surface kinks produced by mechanical damage, cleavage, and chemical etch pitting appear to act as nucleation sites for thermal decomposition. A large amount of decomposition occurs when a GaAs specimen is located at the hot end of a long quartz tube along which a temperature gradient exists. Under these decomposition conditions, As {111} faces are completely corroded in a noncrystallographic manner whereas crystallographic decomposition pits are produced on the Ga {111} and {110} faces. The mass loss due to decomposition is estimated and compared to experimental values. Author

N64-12093 Joint Publications Research Service, Washington, D.C.

DIRECT OBSERVATION OF THE INTERACTION OF DISLOCATIONS WITH SECOND PHASE PARTICLES

M. P. Usikov and L. M. Utevskiy 26 Dec. 1963 10 p refs Transl. into ENGLISH of an article from Zavodsk. Lab. (Moscow), v. 29, no. 8, 1963 p 944–948
(JPRS-22471; OTS-64-21132) OTS: $0.50

A method is suggested for direct electron-microscopic investigation of thin foils of an alloy of the type ЭИ 437, obtained by electropolishing aged ribbons having a thickness of 40μ to 100μ, which have undergone plastic deformation. Various deformation configurations were found that are characteristic for the diphase structure, with various dispersions of the second phase coherent with the matrix. Author

N64-12108* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

ON THE MECHANISM OF DUCTILE BENDING IN IONIC CRYSTALS

Charles E. May Washington, NASA, Dec. 1963 11 p refs (NASA TR R-186) OTS: $0.50

This report presents experimental evidence in support of a mechanism that explains the bending of face-centered-cubic ionic single crystals such as sodium chloride. When a specimen is deformed in flexure, some new dislocations are generated while others are driven from the sample; some of the remaining dislocations align themselves along the {110} slip planes to produce "orientation" domain boundaries perpendicular to the slip planes. This type of process is generally referred to as mechanical polygonization. The existence of orientation domains was confirmed by an X-ray diffraction technique. The number of domains increases with increasing deflection, and there is slight evidence that the average angle between adjacent domains may also increase with increasing deflection. An approximate value for the average angle attained between adjacent domains is about 1/4°. Observation of curvature of the fracture faces also lends support to the correctness of the model. Author

N64-12160 Westinghouse Electric Corp., Baltimore, Md. Aerospace Div.

MIROS PROGRESS LETTER NO. 5 [20 SEP. to 20 OCT. 1963]

W. E. Ward [1963] 13 p
(NASA Contract NASw-703)
(NASA CR-55087; AAD-51175) OTS: $1.60 ph, $0.80 mf

An analysis of the F center modulation transfer scheme was made, and the essential parts of it are included in the report as follows: (1) color centers and optical modulation; (2) production of colored crystals; (3) characteristics of colored crystals; and (4) modulation transfer with colored center crystals. R.T.K.

N64-12173 Purdue U., Lafayette, Ind.

PHOTOCONDUCTIVITY AND OPTICAL PROPERTIES OF SEMICONDUCTORS Annual Summary Report

H. Y. Fan 15 Nov. 1963 4 p
(Contract Nonr-1100(04))

Photoconductivity studies were made in n-type GaSb. Spectral response was measured in the temperature range 300° K to 77° K; some measurements were also made near liquid-helium temperature. The photoresponse extends beyond the intrinsic absorption edge, to photon energies about 0.1 ev smaller than the energy gap. The extension of the response was due to an impurity level 0.1 ev above the valence band. The impurity or lattice defect was introduced by tellurium or selenium which was used to compensate p-type material in order to obtain the n-type samples. Optical absorption of impurities in germanium was also studied. Chemical shift and chemical splitting of the ground state of the donor impurities were determined from measurements of the infrared excitation spectra of these impurities. The effect of strain on the absorption spectrum was investigated in order to study the symmetry of the energy states of acceptor impurities. R.T.K.

N64-12200 Emmanuel Coll., Boston, Mass. Research Language Center

THE TEMPERATURE AND PRESSURE EFFECT ON ELECTRON TERMS IN CRYSTALS [UBER DEN TEMPERATUR- UND DRUCKENINFLUSS AUF ELEKTRONENTERME IN FRISTALLEN]

H. K. Paetzold Bedford, Mass., AF Cambridge Res. Labs. [1963] 30 p refs Transl. into ENGLISH from Z. Physik (Berlin), v. 129, 1951 p 123–139
(Contract AF 19(604)-8505)
(E-T-G-63-9; AD-413010)

The effect of temperature and pressure on Cr^{+++} lines in ruby and alexandrite and on Nd^{+++} lines in Pr(Nd) $(NO_3)_3 \cdot 6H_2O$ is examined. By increasing the pressure (reducing the lattice constants) there is a depression in the centers of gravity of the terms and an increase in the splitting of the term. Since the opposite behavior of the temperature and pressure shifts cannot be understood enough from a purely static method of observation of the crystal lattice in an experiment, an effect from thermal lattice vibrations is assumed which can be formally represented by a "vibration dependent" temperature change adusted toward the temperature of the red region. The temperature increase in the line widths is much greater as the temperature increases with $\sqrt{T}$ and can be well represented by an e-function of the temperature. It is not to be interpreted exclusively as a Stark effect of the component of the electric crystal field which varies with time, but rather requires an additional element member, strongly dependent on temperature and the terms, which in magnitude and temperature variation is very similar to the shift to the red region, caused by the vibration mentioned above. Author

N64-12264 Army Missile Command, Huntsville, Ala. Redstone Scientific Information Center

THE EVAPORATION OF SOLID BODIES

M. K. Baranaev 16 May 1963 8 p refs Transl. into ENGLISH of an article from Zh. Fiz. Khim. (Moscow), v. 20, 1946 p 399–402
(RSIC-13; AD-404919)

The accommodation coefficients of ice, solid phenol, solid benzene, and camphor were calculated using Knudsen's formula. Results of these calculations lead to the conclusion that the accommodation coefficients of solid bodies have the same order of magnitude as those of liquids; therefore, the rates of evaporation in a vacuum and in air for both liquefied and solid bodies are approximately the same. Thus, the evaporation of solids and liquefied bodies in air conform to the same kinetic law. I.v.L.

N64-12276 Emmanuel Coll., Boston, Mass. Research Language Center
SYNTHESIS OF A NICKEL OXIDE SINGLE CRYSTAL BY THE VERNEUIL METHOD
Johshu Nakazumi Jul. 1963 23 p refs Transl. into ENGLISH of an article from J. Chem. Soc. Japan (Tokyo), v. 59, no. 11, 1956 p 1304–1308
(Contract AF 19(604)-8505)
(E-T-J-63-3; AD-424512)

Investigation of the condition required to produce nickel oxide powder that is suitable for flame fusion indicated that of the three raw reagents used (nickel ammonium sulfate, nickel sulfate, and nickel nitrate), the powder produced from the nickel sulfate by calcinating at 900° C was most suitable for synthesis. The physical properties of a boule made from nickel oxide powder were investigated. The specific gravity of the crystal was 6.82, its hardness on the Mohs scale was 6.0, and it was cleaved easily in the direction (100). X-ray analysis showed one perfect crystal with a cubic structure. The other crystals found were rhombohedral and had twin structures whose twin crystal plane was (001), a lattice constant of a = 4.168 kX, and an axis angle of 90.3° 6'. From the results of the measurements of the difference in magnetization for antiferromagnetic crystals, the Neel point was found to be close to 250° C. P.V.E.

N64-12312 Radio Corp. of America, Princeton, N.J.
INVESTIGATION OF CARRIER INJECTION ELECTROLUMINESCENCE Semiannual Scientific Report No. 4, 16 Jan-31 Jul. 1963
A. G. Fischer, W. H. Fonger, H. I. Moss, R. L. Peterson, and P. Donahue 15 Aug. 1963 58 p refs
(Contract AF 19(604)8018)
(AFCRL-63-389; AD-424852) OTS: $5.60

Tunnel injection through thin films offers the most promise at present. New methods for improving the efficiency of this effect are described. Practical work has yielded conducting, luminescent CdS films of up to 34% quantum efficiency under photoexcitation, the highest value ever reported for films. ZnSe films of up to 13% quantum efficiency have been routinely prepared and their properties studied. N-type ZnTe crystals have been prepared and their properties studied. N-type ZnTe crystals have been prepared for the first time by growth under high zinc pressure. Study of evaporated ZnTe films showed anomalously high diffusion of silver at room temperature. ZnSe-ZnTe sandwich structures were prepared which show electron injection from n-ZnSe into p-ZnTe. Author

N64-12372 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ABOUT A CERTAIN METHOD OF RECORDING WEAK INFRARED RADIATION
S. M. Kozel 16 May 1963 23 p refs Transl. into ENGLISH from Tr. Mosk. Fiz. Tekhn. Inst., no. 8, 1962 p 73–76
(FTD-TT-63-180/1+2; AD-409093) OTS: $1.10

A modulation radiometer for the near-infrared region is described. Glowing phosphorus is used as the receiving element. J.E.T.

26 PROPELLANTS AND COMBUSTION

Includes fuels; igniters; and oxidizers. *For related information see*: 07 Chemistry; and 27 Propulsion.

N64-11462 Louvain U. (Belgium) Lab. of Inorganic Chemistry
INHIBITION OF FLAME REACTIONS Technical Documentary Report [Jul. 1, 1961–Jun. 30, 1963]
A. Van Tiggelen Wright-Patterson AFB, Ohio, AF Aero Propulsion Lab., Oct. 1963 67 p refs
(Contract AF 61(052)-538)
(RTD-TDR-63-4011; AD-423667)

The study of flame inhibition by dispersed solid particles has been made in a constant flow system. Solid particles act by both a cooling effect and by a more specific surface destruction of the free radicals which propagate the chain reaction. A theoretical formula is proposed which allows the calculation of the necessary amount of powder which extinguishes the flame. A very good agreement with the experimental data is observed. Homogeneous inhibition by means of additives has been investigated, especially the behavior of ternary mixtures (two fuels and one oxidizer or the reverse) at the flammability limits. The reciprocal influence of additives on the flammability limits is to be ascribed both to a temperature effect and to a more specific effect on the reaction kinetics; the substitution of more reactive by less reactive chain carriers (free radicals) takes place. Author

N64-11763 Princeton U., N.J. Guggenheim Labs.
THE MEASUREMENT OF THE TEMPERATURE PROFILES OF BURNING SOLID PROPELLANT BY MICROTHERMOCOUPLES Technical Report, 1 Jan. 1962–30 Sep. 1963
Alberto J. Sabadell (M. S. Thesis) and Joseph Wenograd 23 Sep. 1963 104 p refs
(Contract Nonr-1858 (32); ARPA Order 23-63, Amendment 21)
(Aeronautical Eng. Rept.-664; AD-422387)

Techniques have been developed for the routine fabrication and handling of microthermocouples made from platinum–platinum 10% rhodium Wollaston wire with 0.0003 in. or finer diameter. Thermocouples with bead sizes no larger than 15 μ are cast into composite propellants or glued into double-base propellants. The casting of these thermocouples into composite propellants, primarily a PBAA binder containing 70% fine (9μ) ammonium perchlorate, has been accomplished with a thermocouple recovery rate of approximately 65%. With the propellant strand burning in cigarette fashion, the thermal wave passes over the thermocouple. The voltage vs. time trace thus obtained permits the determination of the temperature distribution in the combustion wave. Analysis of this curve, by means of the steady-state energy equation with appropriate assumptions, gives a method for determining the surface temperature of the propellant. Author

N64-11973 Joint Publications Research Service, Washington, D.C.
A DIAGRAM OF THE PRODUCTS OF GAS COMBUSTION WITH ALLOWANCE FOR DISSOCIATION

G. P. Verkhivker, N. G. Zubatov, and P. A. Kotlyarevskiy *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 87–96 refs (See N64-11965 03-01) OTS: $3.50

An I-S-diagram (I is the heat content and S is the entropy) for the combustion products of Saratov gas (CH_4—94.0%; C_2H_6—1.2%; C_2H_2—0.7%; C_4H_{10}—0.2%; N_2—3.3%; and CO_2—0.2%) is presented. The compositon of the air by weight (mass) used was $O_2 = 0.232$ and $N_2 = 0.768$. The temperature range for the combustion products is 800° and 3000° K. P.V.E.

N64-11977 Joint Publications Research Service, Washington, D.C.

THE MECHANISM OF THE COMBUSTION OF POWDERS

P. F. Pokhil and V. M. Maltsev *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 128–137 refs (See N64-11965 03-01) OTS: $3.50

Experimental data are presented of the basic physical properties of a solid-fuel flame (nitroglycerine powder), and of an explosive substance (hexogene), in the case of combustion in a constant-pressure bomb. Author

N64-12120 Bureau of Mines, Berkeley, Calif. Berkeley Thermodynamics Lab.

HEATS OF COMBUSTION AND FORMATION OF CARBIDES OF TUNGSTEN AND MOLYBDENUM

Alla D. Mah 1963 13 p refs

(BM-RI-6337)

The energies of combustion of two carbides of tungsten and two carbides of molybdenum were measured, and the corresponding standard heats of combustion were derived. Results are presented. The combustion heats were combined with the heats of formation of the corresponding metal trioxides and carbon dioxide to obtain the heats of formation which are given. The heats of combustion and formation of MoC are tentative. Author

N64-12125 Advisory Group for Aeronautical Research and Development, Paris (France)

EXPLOSIONS, DETONATIONS, FLAMMABILITY, AND IGNITION

S. S. Penner (Calif. Inst. of Tech.) and B. P. Mullins (Natl. Gas Turbine Estab., Pyestock, Gt. Brit.) New York, Pergamon Press, 1959 300 p refs

(AGARD-31) Available from Pergamon Press: $10.00

This book is divided into two parts: selected analytical studies on explosions, detonations, flammability limits, ignition of gases, and heterogeneous burning; and experimental and theoretical studies of flammability, ignitibility, and explosion prevention. P.V.E.

N64-12177 Southwest Research Inst., San Antonio, Tex.

STUDIES OF INTERNAL DISPLACEMENTS IN SOLID PROPELLANT GRAINS: EMBEDDED PARTICLE, X-RAY DETECTION SYSTEM Interim Report

L. U. Rastrelli, R. C. De Hart, and J. D. Michie 28 Oct. 1963 50 p

(Contract Nonr-3363(00)(FBM))

(AD-423571)

This report describes the X-ray detection facility and the embedded particle technique for obtaining measurements of displacements with models of solid propellant grains. Author

N64-12227 Air Force Systems Command, Wright-Patterson AFB, Ohio

EXPLOSION-PROOF TESTING TECHNIQUES Technical Documentary Report [15 May 1962-14 Nov. 1962]

W. L. Haskin Feb. 1963 24 p refs

(ASD-TDR-62-1081; AD-400483) OTS: $0.75

This report briefly discusses ignition properties of gaseous fuel-air mixtures with application of these properties to explosion-proof testing technique. Present test methods are discussed, and possible changes in test procedure are suggested. A suggested testing specification is presented. Author

N64-12240 Aeronutronic, Newport Beach, Calif. Research Lab.

INVESTIGATION OF THERMODYNAMIC PROPERTIES OF ROCKET COMBUSTION PRODUCTS Fourth Quarterly Technical Report, 1 Jul.-30 Sep. 1963

D. L. Hildenbrand, L. P. Theard, and F. Ju 30 Oct. 1963 10 p refs

(Contract AF 04(611)-8523)

(Publ. No. U-2352; AD-424393)

An investigation to provide thermodynamic data for beryllium species in areas where uncertainties exist is discussed. Data obtained as a result of the investigation in the following areas are presented and discussed: (1) vapor pressure of $BeCl_2$—measurements made by the torsion-effusion method using quartz, platinum, and graphite effusion cells over the range 460° to 504° K are presented in tabular form; (2) mass spectrometric study of the reaction of HCl(g) with beryllium oxide—the $Be^+/BeCl^+$ ratio for the saturated vapor is only slightly different from the value for high-temperature, undersaturated vapor, whereas for the saturated vapor the relative intensity of $Be_2Cl_4^+$ is less than one-tenth its value for undersaturated vapor. Experiments show that appreciable amounts of BeCl(g) do exist in high-temperature vapor, and at temperatures around 2100° K the principal species present in the equilibrium vapor above beryllium oxide are Be(g) and O(g). P.V.E.

N64-12261 Naval Ordnance Lab., White Oak, Md.

ON THE ORIGIN OF SHOCKWAVES FROM CONDENSED EXPLOSIONS IN AIR. PART 2: MEASUREMENTS OF AIRSHOCK PRESSURES FROM 8-LB TNT SPHERES OF VARIOUS DENSITIES AT AMBIENT PRESSURES

L. Rudlin Oct. 1963 85 p refs

(NOL-TR-63-13; AD-422442)

Airshock pressures have been measured over the range from about 80 to 2 psi from about 25 TNT spheres of density ranging from about 1.01 to 1.625 gm/cm^3. The purpose of these experiments was to examine the validity of some of the concepts assumed to hold in the use of cube-root scaling procedures. The results indicate that the airshock peak pressures and the pressure-time signatures do not depend on the calculated detonation variables of the various density spheres. Instead, the airshock pressure depends only on the energy released by the explosion, verifying a basic assumption of the cube-root procedure. Author

N64-12311 Rocketdyne, Canoga Park, Calif.

SUPPRESSION OF PENTABORANE FIRES AND EXPLOSIONS [Technical Report, 15 Jul. 1962-14 Jul. 1963]

R. J. Thompson, Jr. Wright-Patterson AFB, Ohio, AF Aeropropulsion Lab., Sep. 1963 87 p refs

(Contract AF 33(657)-9188)

(RTD-TDR-63-4007; R-3302; AD-423709) OTS: $2.25

The prevention of pentaborane fires and explosions in air by chemical techniques was investigated by means of a diffusion burner and a heterogeneous shock tube. The results indicate chemical suppression of pentaborane-air fires is practical. Studies on decontamination of pentaborane were also accomplished. Author

N64-12378 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.
EFFECT OF OXYGEN ENRICHED ATMOSPHERE ON BURNING RATE OF FABRICS Interim Report
Maria A. Chianta and Alice M. Stoll 30 Aug. 1963 16 p ref
(NADC-MA-6316; AD-423752)

To determine the optimal atmospheric conditions attainable in space capsules, the burning pattern of several fabrics in oxygen enriched environments (20% to 100% O_2) at 4.6 psia pressure has been studied. The data demonstrate that, at the pressure used, burning is enhanced by oxygen enrichment regardless of the ratio of oxygen to nitrogen. A definite though small advantage exhibited by the synthetic material HT-1 over the other two fabrics implies that it would be profitable to pursue the study by varying the pressure as well as the oxygen concentration. Author

27 PROPULSION

Includes airbreathing, electric, liquid, nuclear, and solid propulsion. *For related information see*: 04 Aircraft; 06 Auxiliary Systems; 26 Propellants and Combustion; and 30 Space Vehicles.

N64-11539 Naval Ordnance Test Station, China Lake, Calif.
MAGNETOHYDRODYNAMIC POWER GENERATION FROM A SUPERSONIC ROCKET EXHAUST
Leroy J. Krzycki, Harold M. Larsen, and William M. Byrne, Jr. Jun. 1963 42 p refs
(NAVWEPS-8111; NOTS TP 3186; AD-422905)

A theoretical and experimental feasibility investigation of an MHD electrical power generator was conducted, using a supersonic rocket engine exhaust (Mach 2.3, 2160 m/sec) as the working fluid. Theoretical calculations of thermal ionization and gas conductivity, using digital computer computation, indicated the advantages of a supersonic gas source. Experimental firings of a liquid rocket-MHD power generator proved the feasibility of the concept, and indicated areas of developmental difficulty. Author

N64-11552* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYSIS OF JET-PLUMING INTERFERENCE BY COMPUTER SIMULATION OF MEASURED FLIGHT MOTIONS OF TWO RAM A FOURTH STAGES
William F. Hinson and Sherwood Hoffman Washington, NASA, Dec. 1963 44 p refs
(NASA TN D-2018) OTS: $1.25

The effect of jet pluming on the aerodynamic characteristics of two free-flight rocket-propelled cone-cylinder-flare vehicles has been determined by comparing the aerodynamic coefficients required (in a six-degree-of-freedom computer program) to simulate the angular-flight motions measured with and without jet-pluming interference. Equation inputs for the normal forces and moments were assumed to be nonlinear with angle-of-attack due to jet-pluming effects. The analysis was made for the vehicles flying at velocities of 11,500 to 17,800 fps at altitudes from 131,000 to 174,000 ft. Also presented is a comparison of the flight-performance data of the two RAM A (radio attenuation measurement) vehicles. Author

N64-11591* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
ION ROCKET WITH A PERMANENT MAGNET
Paul D. Reader Repr. from Astronautics and Aerospace Eng., Oct. 1963 1 p

Results are discussed of a program to determine the feasibility of utilizing a permanent-magnet circuit to provide the magnetic field of the shape and strength required for the efficient operation of a low-current-density electron-bombardment ion rocket. Performance comparisons were made between two thrustors using field coils and two using permanent-magnet circuits. Internal geometry of all thrustors used in the tests was identical. The ion-chamber performance of the permanent-magnet thrustor was almost exactly the same as that of the field-coil thrustor chamber. The maximum performance difference occurred at an off-design point at which the permanent-magnet thrustor showed ionization process losses about 10% less than the field-coil unit. The only significant change in thrustor performance was elimination of the field-coil power loss from the permanent magnet and its 2% to 4% increase in thrustor power efficiency. The results indicated that substitution of a permanent-magnet circuit for the field coil produces no significant weight change, and that systems characteristics and thrustor efficiency are improved through elimination of field-coil power supply and controls. P.V.E.

N64-11764 Oxford U. (Gt. Brit.) Clarendon Lab.
THEORIES OF MAGNETISM First Annual Technical Report, 1 Oct. 1962-30 Sep. 1963
R. J. Elliott [1963] 26 p refs
(Contract DA-91-591-EUC-2698)

Conduction electrons interact with the localized 4f magnetic electrons through the intra-atomic exchange. This causes a spin polarization in the conduction electrons, which can couple the magnetic electrons on different atoms by an effective exchange interaction of the Ruderman–Kittel and Yoshida type. The form of this exchange leads directly to the remarkable wave variations observed in the ordered magnetic structures. When these ordered magnetic structures form, the conduction electrons feel a static exchange potential of a new symmetry, which causes the introduction of new 'superzone' boundaries and affects the Fermi surface. One important effect which has been investigated in detail is the variation of the effective exchange as the Fermi surface changes, in particular, the wavelength of the ordering varies with temperature. A third and rather different problem has been investigated. Thulium shows a transition from a longitudinal wave magnetic order to an antiphase domain structure at lower T. A Bragg–Williams type of theory has been constructed which allows a discussion of this transition. Author

N64-11790 Argonne National Lab., Ill.
TRANSPORT SOLUTIONS TO THE MONOENERGETIC CRITICAL PROBLEMS
George J. Mitsis (Ph.D. Thesis – Mich. U.) Nov. 1963 171 p refs
(Contract W-31-109-eng-38)
(ANL-6787)

Transport solutions to the monoenergetic plane, spherical, and cylindrical critical problems with isotropic scattering are developed by the method of singular expansion modes. The results are given in the form of exact expressions for the neutron distributions and criticality conditions. These expressions depend on expansion coefficients which are shown to satisfy Fredholm integral equations of the second kind. Successive approximations on the coefficients lead to the asymptotic results of diffusion theory, as well as to easily accessible transport corrections. Author

N64-11822 Oak Ridge National Lab., Tenn.
ISOTOPIC MASS SPECTROMETRY OF THE ELEMENTS
E. J. Spitzer and J. R. Sites, comps. 17 Dec. 1963 83 p refs
(Contract W-7405-eng-26)
(ORNL-3528) OTS: $2.00

The Analytical Mass Spectrometry Section at Oak Ridge National Laboratory has, for many years, been determining relative isotopic abundances from solid samples. Thus, useful analytical mass spectrometer experience with every pertinent element has been obtained. These include the 55 polyisotopic elements as well as products of irradiation and fission. The techniques used have been summarized in this report. A separate page for each element lists preferred compound, loading of sample, manner of obtaining a stable ion beam, and solutions of special problems. Author

N64-11879 France. Office National d'Etudes et de Recherches Aeronautiques, Chatillon-sous-Bagneux
PROPULSION ASPECTS
J. Surugue *In* Advisory Group for Aeron. Res. and Develop. Proc. of the 12th AGARD Gen. Assembly Sep. 1962 p 46-69 In FRENCH (See N64-11877 03-01)

The accomplishments of the AGARD Combustion and Propulsion Panel (and of its predecessor, the Combustion Panel) over the past 10 years are reviewed. Since the progress in aviation during that time can be considered as largely due to advances in motor technology, the different types of engines are considered in order of their development. A weight-to-power ratio is expressed in equivalent terms for each type of engine, and the results are plotted for comparison. The topics of the five AGARD colloquia on combustion are reviewed, and the mutual enrichment of the participants from different nations and different disciplines is stressed. The effect of man on the power and weight requirements of a vehicle will be the next study of the Combustion and Propulsion Working Group; the problems which will be considered are outlined briefly. M.P.G.

N64-11887 Lockheed Missiles and Space Co., Sunnyvale, Calif.
NUCLEAR ROCKET FLIGHT TESTING FOR OPERATIONAL MISSIONS
H. Radd 18 Mar. 1963 17 p
(LMSC-A303791; NSP 63-41)

The first phase of nuclear rocket flight testing, designated as RIFT (Reactor-In-Flight Test), will be limited to relatively short ranges and ocean impact of the nuclear stage. Subsequent test flights will progress toward achievement of an operational flight mode, wherein the nuclear stage will be operated at near-orbital, orbital, and escape velocities. The paper emphasizes this flight region and considers the major problems of safety, flight sequences, and aerospace environments. The nuclear hazard potential is discussed in terms of orbital and suborbital start modes, and possible system countermeasures. Flight sequences are described with particular emphasis on nuclear-stage operation, and a postulated failure profile for the total launch vehicle is presented. Nuclear engine startup, full-power operation, and shutdown, as functions of mission profile, are examined. Author

N64-11904* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
COMPILATION OF THEORETICAL ROCKET PERFORMANCE FOR THE CHEMICALLY FROZEN EXPANSION OF HYDROGEN
Ernie W. Spisz Washington, NASA, Dec. 1963 28 p refs
(NASA TN D-2080) OTS: $0.75

Theoretical performance data are presented for the isentropic expansion of hydrogen through a converging-diverging nozzle with the composition chemically frozen at stagnation conditions. The performance data presented are weight fraction of molecular hydrogen dissociated, flow rate per unit throat area per unit stagnation pressure, specific impulse, power requirements, and efficiency. The ranges of stagnation temperature and pressure considered are 2000° to 5000° K and 0.1 to 500 psia, respectively, for nozzle area ratios from 5 to ∞. The data are presented primarily in tabular form, with a limited number of figures to illustrate graphical presentations that have been found to be useful. Author

N64-11908 Advisory Group for Aeronautical Research and Development, Paris (France)
THRUST REVERSER PERFORMANCE AND THE INGESTION PROBLEM
D. M. Brown (Rolls-Royce Ltd.) Jan. 1963 35 p refs
(AGARD-415)

The thrust reverser is now a familiar and very reliable part of the jet transport powerplant. One of the problems associated with its use, ingestion of either gas or stones, may severely limit reverser effectiveness, and prove extremely expensive to the airline operator in engine repairs, if it is not dealt with during powerplant design. It is therefore important that a reliable method of simulating the problem at model scale should be available. Such a method has been established and confirmed by full-scale results on the several transports powered by Rolls Royce engines. Author

N64-11941 National Gas Turbine Establishment, Pyestock (Gt. Brit.)
LIQUID AIR CYCLE ENGINES FOR HIGH SPEED AIRCRAFT
R. A. Jeffs and A. B. P. Beeton London, Ministry of Aviation, Nov. 1963 Presented to the B.I.S. Symp. on Aerospace Vehicles London, 13 Nov. 1963

Two types of liquid air cycle engines (LACE) in which liquid air and hot gaseous hydrogen can be used for propulsion or control purposes are discussed. The straight LACE engine system burns the liquid air and hydrogen directly in the rocket chamber. It seems unlikely that this system will ever replace the conventional ramjet engine for main propulsion at low subsonic speeds; however, there may be advantages in the use of such a system in conjunction with a ramjet which might overcome the severe performance limitations imposed by the rich fuel/air ratios otherwise needed in the heat exchanger of this system. These advantages include the use of small quantities of stored liquid air for aircraft control and maneuver. The air-scoop or oxygen condensation system incorporates a separator after the air liquefier and is used in conjunction with a considerably larger hydrogen-burning ramjet than that in the case of the straight LACE as the main propulsive unit. The liquid oxygen from the separator is stored for later use in a rocket engine. I.v.L.

28 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. *For related information see*: 05 Astronomy and Astrophysics; 16 Life Sciences; and 29 Space Sciences.

N64-11500 Kodiakanal Observatory (India)
A STUDY OF SOME OPTICAL PHENOMENA ASSOCIATED WITH SOLAR FLARES
A. Bhatnagar and L. M. Punetha 22 Jul. 1963 13 p refs
(Bulletin CLXII; DGO 11.162) Available from Kodaikanal Obs.: 10s 1d

Sequences of Hα spectroheliograms covering nine solar flares have been examined for flare-associated optical phenomena. A detailed description is given of the diversity of changes that take place in the flare region during its outburst and decay. "Disparition brusques" are common features during flare occurrence, and the paper contains instances of these phenomena. However, not every flare, regardless of its importance, necessarily produces a "disparition brusque." A case of sudden disappearance of a dark filament observed in the flare sequence of February 22, 1926 suggests that Doppler displacement caused by a motion of the filament is the cause of its disappearance from the normal Hα spectroheliogram. The incidence of flares with respect to both the spot lifetime and its spatial form has been discussed. Author

N64-11590* Chicago U., Ill. Enrico Fermi Inst. for Nuclear Studies
KINEMATICAL HYDROMAGNETIC THEORY AND ITS APPLICATION TO THE LOW SOLAR PHOTOSPHERE
E. N. Parker Repr. from Astrophys. J., v. 138, no. 2, 15 Aug. 1963 p 551–575 refs Previously processed; for abstract see N63-13991 09-05
(NASA Grant NsG-96-60)

The magnetic field B is computed from the hydromagnetic equations for a variety of given velocity fields v. The velocity fields are classified as turbulent if their time correlation extends no more than their scale a divided by their characteristic velocity v. The velocity fields are classified as persistent if their time correlation extends beyond a/v but is short compared with the magnetic diffusion time $a^2/\lambda(\equiv c^2/4\pi\sigma)$, and as stationary if their time correlation extends beyond a^2/λ. It is shown that turbulent fluid motions in the solar photosphere generate rms fields which are a few times the large-scale field strength B_0 in the photosphere. Where $B_0 \geq 20$ G, this leads to equipartition of energy between the turbulent magnetic and velocity fields. It is shown that persistent motions tend to draw the field into concentrated sheets and filaments. The observed supergranulation in the solar atmosphere tends to concentrate vertical magnetic fields around the edges of the cells, where the field density may become 10^2 times larger than in the interior of the cell. It is shown that stationary motions tend to exclude the magnetic field from the region of fluid motion. Author

N64-11624* Minnesota U., Minneapolis
OBSERVATION OF THE VAN ALLEN RADIATION REGIONS DURING AUGUST AND SEPTEMBER, 1959. 4: THE OUTER-ZONE ELECTRONS
R. L. Arnoldy, R. A. Hoffman, and J. R. Winckler Repr. from J. Geophys. Res., v. 67, no. 7, Jul. 1962 p 2595–2612 refs
(NASA Contract NASw-56)
(TR-CR-51)

A study is reported of the data from the radiation detectors aboard the Explorer VI earth satellite as the spacecraft passed through the outer zone, during a period when the count rate time variations and the geomagnetic activity were low. The radiation detectors aboard the satellite were an ionization chamber, a Geiger counter, a proportional counter telescope, and a scintillator. Extensive calibrations were made to determine the response of these detectors to monoenergetic electrons when inside a spare payload. In using these calibrations and fitting assumed power-law spectra of electrons to the data, it is seen that the spectrum is flat and must extend to several Mev at the small ranges, with the ion chamber and Geiger counter responses there due primarily to direct electron detection. The intensity of the energetic electrons is shown to decrease with increasing range as the spectra steepen and the radiation softens, resulting in an increasing contribution of bremsstrahlung to the rates of the chamber and Geiger counter. The spectral shape of the outer zone, as suggested by this analysis, allows us to interpret the minimum observed in the Geiger counter rate, at an equatorial geocentric range of 19,000 km, as having spectral-detector origin rather than as representing the removal of radiation by an anomaly in the earth's magnetic field. Author

N64-11636 Kodaikanal Observatory (India)
AN ANALYSIS OF ERUPTIVE PROMINENCE MOTIONS
Nirupama Subrahmanyam 18 Jun. 1963 25 p refs
(*Its* Bull. 163) Available from Gov. of India Press, Delhi: $1.89

The motions characterizing the eruption of eight prominences have been studied. It is found that all parts of a prominence adhere to a general pattern of motion, on which are superposed small, but significant, individual deviations. Sky-plane components of the trajectories tend to fall broadly into two types, one type showing strong curvature and large accelerations transverse to the direction of solar gravity, while trajectories of the second type are long and curved slightly, showing large accelerations away from the sun. It is suggested that an eruptive prominence has a compound magnetic field, consisting of a stable weak field and a momentary strong component, and that the type of trajectory of erupting material is primarily decided by whether the equilibrium in the active prominence is destroyed by the kinetic energy exceeding the magnetic energy, or vice-versa. Author

N64-11648 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ESTIMATES OF RADIATION DOSES IN SPACE ON THE BASIS OF CURRENT DATA
Trutz Foelsche *In* Comm. on Space Res. Life Sci. and Space Res. 1963 p 48–94 refs (See N64-11647 03-01)

The overall ionization dosage of the low level galactic cosmic radiation in free space is estimated to be, even in solar minimum years, equivalent to less than 50 rem/year or 1 rem/week. Mass shielding up to 80 g/cm^2 would not reduce the ionization dosage, but would shield against heavy primaries and heavy ionizing secondaries, thus reducing the biological dose. The flux of energetic protons in the maximum intensity zone of the inner Van Allen belt is by about four orders of magnitude higher, and the energy and penetration power, of course, lower. A shield of 25 g/cm^2 would reduce the dose rate from 20 rad/hour under 2 g/cm^2, to 5 rad/hour. These proton dose rates, and also the electron and X-radiation dose rates under some g/cm^2 shielding of low z-number material, will not constitute a radiation hazard for 2-hr flights straight through the inner and outer belt. Staying within the maximum of the inner belt for two days, however, would lead, even with a 25 g/cm^2 depth of outer shield, to a body dose of 200 rad, which is the permissible limit. Author

N64-11718* National Engineering Science Co., Houston, Tex.
SOLAR WEATHER AND EARTH WEATHER IN AUGUST AND SEPTEMBER 1961 AS SHOWN BY SATELLITES AND OTHER OBSERVATIONS, PART A
John C. Freeman, Jr., Leon F. Graves, and W. H. Portig *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 1–29 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf

The relation between solar variation and weather on earth was investigated, using data from Explorer XII and Mariner II, satellite drag measurements, new theories of the downward propagating inertial waves, and weather observstions. Results indicate that an increase in solar winds causes hydromagnetic heating of the mesosphere and high pressure over the poles. Five days after this increase in heating and pressure, an increase in tropospheric westerlies occurred; thirteen to nineteen days later a decrease occurred. I.v.L.

N64-11719* National Engineering Science Co., Houston, Tex.

A MODEL OF THE ATMOSPHERE FOR INVESTIGATING THE INTERACTION WITH THE SUN THROUGH THE SOLAR WIND, PART B

John C. Freeman, Jr. and Leon F. Graves *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 30-53 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf

This model considers the summer and equatorial atmosphere and its vertical structure. It is assumed that the ionosphere is very stable and ends in a discontinuity (called the mesopause) at approximately 100 km with a density above one-eighth to one-fifth of that of the mesosphere below. There is a layer about 50 km thick just below the ionosphere in which the temperature increases with descent. This is the mesosphere. Since it is a region that is heated below and is capable of chemical reaction among gaseous components, it should have weather phenomena similar to those encountered in the troposphere. The stratopause occurs at about 50 km. This is the top of the stratosphere and the bottom of the mesosphere. Because of the overwhelming stability, any change in thickness of the mesosphere is not likely to result from changing the height of the stratopause. However, the mesopause is even more stable so that the mesosphere may be expected to be of a relatively constant thickness. The stratosphere goes down to the tropopause. Below the tropopause, accepted atmospheric models are quite adequate for the purpose of energy transmission. This model of the atmosphere is based on Johnson's temperature diagram. I.v.L.

N64-11720* National Engineering Science Co., Houston, Tex.

THICKNESS OF A SHOCK WAVE IN THE SOLAR WIND, APPENDIX 1

John C. Freeman, Jr. *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 1-1-1-7 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf

In his text book, Ion Flow Dynamics, Demetrios G. Samaras predicts the thin shock wave in the laboratory as being limited by the Larmor radius. The estimate for the Larmor radius for the solar plasma is 600 km. If it is accepted that the Larmor radius is the thickness of the shock and that this is a mechanical shock resulting from the streamlines flowing around the magnetopause of the earth, then (because of its "small thickness") the distinct possibility arises that there is a shock caused by the moon. The moon shock would be one place to look for the link between the moon and the earth's rainfall. The shock associated with the moon would be in its wake similar to the disturbance discussed by Bowly et al (1962) in the wake of an island under an inversion. I.v.L.

N64-11725* National Engineering Science Co., Houston, Tex.

INDICES OF SOLAR ACTIVITY, APPENDIX 6

Leon F. Graves *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 6-1-6-5 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf

This report contains references to: (1) "Indices of Solar Activity" by Athay and Warwick (1961) which is a review of the various indices of solar and geomagnetic activity; (2) "Magnetism of the Earth" by Nelson, Hurwitz and Knapp (1962) which summarizes existing knowledge of the earth's magnetic field and its variation in time and space; and (3) "The Sudden Commencement of Geomagnetic Storms" (1960) by Akasofu and Chapman, which defines D_{st} as one part of the average variation in the field during a magnetic storm. I.v.L.

N64-11727* National Engineering Science Co., Houston, Tex.

THOUGHTS DEVELOPED AFTER A DISCUSSION OF SOLAR WEATHER WITH THE STAFF MEMBERS OF THE SOUTHWEST CENTER FOR ADVANCED STUDIES, APPENDIX 8

John C. Freeman, Jr. *In its* Invest. of Relation between Solar Variations and Weather on Earth as Shown by Satellite Data Oct. 1963 p 8-1-8-7 refs (See N64-11717 03-01) OTS: $12.50 ph, $5.48 mf

This summary of "developed thoughts" includes the following: (1) The sun is a magnetically active body in which the perturbations in the magnetic field are larger than the overall field which is poorly defined and almost unknown in detail. (2) Parker's theory of the solar wind has been confirmed with the source being within two to three solar radii of the sun. (3) A solar flare has a sufficiently organized magnetic field to cause some organization of the magnetic field over part of the solar system, especially in a solid angle streaming from it. (4) A spiral magnetic field, with no breaks in the lines, is set up when there is a very strong stream of flares in a short time. (5) The fluid between the earth and the sun is made up of confused weak dipoles moving with the solar wind. (6) There is some heating of the atmosphere as a result of the absorption of the solar ultraviolet. However, the most effective heating is by hydromagnetic waves that originate in the high-altitude areas of the lines of magnetic force and travel down into the area near 100 km and dissipate their energy at about 100 km. (7) Cosmic rays are excited *in situ* by hydromagnetic waves. I.v.L.

N64-11796* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SOLAR X-RAYS: SLOW VARIATIONS AND TRANSIENT EVENTS

William A. White [1963] 18 p refs Presented at the 4th Intern. Space Sci. Symp. Warsaw, 3-11 Jun. 1963

(NASA TM X-51250; NASA-X-614-63-195) OTS: $1.60 ph, $0.80 mf

Solar X-ray flux integrated over the interval 0.1 A to 10 A was measured from the OSO-1 satellite. A slowly varying component of X-ray flux was observed which correlates well with the slowly varying component of 2800-Mc solar radiation, and which can be accounted for by localized sources having the same horizontal extent as Ca plages with thicknesses proportional to their diameter; and having an electron temperature of about $2.8(10)^{6}$° K and an electron density of about $5(10)^{9}$ electrons per cm^3. In addition to a slowly varying component, transient events (X-ray flares) lasting from 10 minutes to a few hours were frequently observed. Correlations with H-α flares, with SID's, and with 2800-Mc transients have been investigated; the results show that, as an indicator of local solar activity, the OSO-1 X-ray experiment was more sensitive by a

large factor than indicators based on ionospheric effects, or than indicators based on observations of solar flux in visible or radio wavelengths. Author

N64-11798* National Aeronautics and Space Adminstration. Goddard Space Flight Center, Greenbelt, Md.

THE SOLAR SPECTRUM FROM 50 ANGSTROMS TO 400 ANGSTROMS

W. M. Neupert, W. E. Behring, and J. C. Lindsay [1963] 20 p refs Presented at the 4th Intern. Space Sci. Symp. Warsaw, 3–11 Jun. 1963

(NASA TM X-51257; NASA-X-614-63-196) OTS: $1.60 ph, $0.80 mf

A scanning monochromator, mounted as a pointed experiment on OSO-1, has been used for observations of solar extreme ultraviolet radiation from 50 A to 400 A. The period of observation was sufficient to observe a slowly varying component having a period of approximately 27 days and correlating with solar activity. The enhancement of radiation during periods of activity was observed to vary from line to line in the spectrum, depending upon the origin of the line in the solar atmosphere. Data showed an increase of 33 percent in the He II Lyman-alpha (304 A) flux, integrated over the entire solar disk, during a period when the Zurich Provisional Relative Sunspot Number increased from zero (11 March 1962) to a maximum of 94 (22 March 1962). Enhancements of approximately a factor of four were observed for the 284 A (Fe XV) and the 335 A (Fe XVI) lines. Author

N64-11868* RAND Corp., Santa Monica, Calif.

MAGNETIC FIELD OF THE EARTH AND PLANETS

J. W. Kern and E. H. Vestine Repr. from Space Sci. Rev. (Dordrecht) v. 2, 1963 p 136–171 refs

(NASA Contract NASr-21(05))

(RM-3523)

Knowledge of geomagnetism and its effects was recently much augmented during the IGY; when added to what is known of stellar fields, interplanetary fields, and meteoric magnetism, and combined with magnetic theory, this knowledge not only suggests that much may be learned of our neighbors in space by making an early determination of their magnetic fields, but also provides a foundation for many inferences and rough estimates on the magnetic fields of other solar-system bodies. Present estimates range from 660 cgs for Jupiter to 0.004 for the smaller satellites and the planetoids. Author

N64-11888 Louvain U. (Belgium) Faculte Des Sciences Appliquees

PHOTO-MAGNETO-ELECTRIC STUDY OF CdS SINGLE CRYSTALS AND ROLLED BISMUTH FOILS Summary Report No. 1 and 2, Nov. 1958-Dec. 1962

Andre Luyckx 5 Feb. 1963 19 p refs

(Contract AF 61(052)-166)

(RADC-TDR-63-117; AD-299135)

CdS single crystals can be formed with high frequency treatment. Hall-constant measurements were made for dark conductivity. Photo-Hall measurements were achieved with pure CdS single crystals irradiated with and without infrared light. A new photomagnetoelectric (PME) effect was found on CdS. PME phenomena can be predicted quantitatively when the polarization photovoltages are measured. Intense PME or TME effects measured with thin-rolled Bi foils are very weak. Author

N64-12002* Chicago U., Ill. Enrico Fermi Inst. for Nuclear Studies

THE PHYSICAL SIGNIFICANCE AND APPLICATION OF L, B_o, AND R_o TO GEOMAGNETICALLY TRAPPED PARTICLES

Edward C. Stone Repr. from J. of Geophys. Res., v. 68, no. 14, 15 Jul. 1963 p 4157–4166 refs

(NASA Grant NsG-179-61; Contract AF 49(638)-1008; Grant AF-AFOSR-62-23)

In a dipole field, many different invariant shells (I,B_m) share exactly the same lines of force. These invariant shells are therefore members of a degenerate system. In the geomagnetic field, which is assumed static and without electric field, these degenerate systems are split by azimuthal asymmetry. A distinction is made, therefore, between the use of parameters as invariants of charged particle motion (invariant representation), and their use as constants for all particles on a line of force (degenerate representation). It is found that McIlwain's L value associates nondegenerate geomagnetic shells with dipole degenerate systems if L, at a point in space, is redefined to apply only to particles mirroring at that point. Emphasis is placed on the redefined L as an invariant parameter of particle motion, and on the near equality of the L value of a particle and the equatorial radius R_0 of the line of force on which the particle is mirroring. With the present definition, the different values of L along a line of force can be identified with the radial separation of particles mirroring on that line as they drift in longitude. This invariant representation (L,B_m) or (I,B_m) is limited only by the accuracy of the determination of the mirror field B_m and the longitudinal invariant I, both of which depend on the accuracy of the magnetic field representation. Author

N64-12018 Boeing Scientific Research Labs., Seattle, Wash. Geo-Astrophysics Lab.

INFRARED MAPPING OF LUNAR CRATERS DURING THE FULL MOON AND THE TOTAL ECLIPSE OF SEPTEMBER 5, 1960

J. M. Saari and R. W. Shorthill Jul. 1963 83 p refs

(Contract AF 18(600)-1824)

(DI-82-0176)

Infrared measurements were made over certain lunar crater regions during the eclipse of September 5, 1960, and the full moon. Five rayed craters were observed to cool less rapidly than their environs during the eclipse, the anomaly being greatest for Tycho and progressively less for Aristarchus, Copernicus, Proclus, and Kepler. The findings are discussed in terms of the thermal properties of the surface, including thickness of insulating layer and age of the craters. Localized variations were found during illumination, evidently attributable to variations in albedo and geometry. Author

N64-12096* California Inst. of Tech., Pasadena

SOLAR MAGNETIC FIELDS AND SPACECRAFT OBSERVATIONS

Leverett Davis, Jr. [1963] 4 p Presented at the Symp. on the Phys. of Solar Flares, NASA, Goddard Space Flight Center, 30 Oct. 1963

(NASA Grant NsG-426)

(NASA CR-52928) OTS: $1.10 ph, $0.80 mf

A description is presented of a tentative model that may explain several features of the Mariner II observations of the solar wind. According to this model, as the solar wind carries away the outer corona, the gas which replenishes it may well up from the photosphere over only a few areas and may spread out at higher elevations to fill the upper corona. As a result the magnetic field in the outer corona, which is swept out to interstellar space by the solar wind, would come through the photosphere in these few areas. The radial component of the

solar magnetic field in the solar wind should remain the same sign over much larger areas of the sun than does the field observed in the photosphere. This model was originally suggested by the Mariner II magnetometer observations, which give some support for this feature of the coronal field. This model may also provide an explanation of the fact that there is a delay of only about a day between the central meridian passage of a plage region and arrival at the earth of the high velocity jet of solar wind that has been associated with it. R.T.K.

N64-12097* Geophysics Corp. of America, Bedford, Mass.
PLANETARY AERONOMY XVI: CORPUSCULAR RADIATION IN THE UPPER ATMOSPHERE
A. Dalgarno Oct. 1963 34 p refs Presented at the IUGG Meeting, Berkeley, Calif., 19–24 Aug. 1963 Submitted for Publication
(NASA Contract NASw-701)
(NASA CR-55113; GCA-TR-63-28-N) OTS: $3.60 ph, $1.22 mf

The efficiencies of fast electrons and protons in producing luminosity and heating by collisions with the atmosphere are discussed, and upper limits to the fluxes of corpuscular radiation are obtained. A possible explanation of high-altitude red auroras is advanced. The effects of the photoelectrons produced in the ionization of the atmosphere by extreme solar ultraviolet radiation are examined, and it is noted that the electron temperature at high altitudes may be anomously large at dawn, the phenomenon being accompanied by a red glow. Author

N64-12198 Emmanuel Coll., Boston, Mass. Research Language Center
THE BEHAVIOR ON NON-RELATIVISTIC ELECTRONS IN A MAGNETIC FIELD AND ITS APPLICATION IN SOLAR PHYSICS
Chen Piao Bedford, Mass., L. G. Hanscom Fld., AFCRL, Jan. 1963 13 p refs Transl. into ENGLISH from Acta Astron. Sinica, v. 7(2), 1959 p 169–174
(Contract AF 19(604)-8505)
(E-T-Ch-63-3; AD-411151)

Topics of discussion include: (1) the distribution law of nonrelativistic electron gas in a magnetic field; (2) the population at different energy levels; (3) a possible new mechanism of celestial radio emission; and (4) a new decay process for the magnetic field and a new acceleration mechanism for charged particles. J.E.T.

N64-12230 Emmanuel Coll., Boston, Mass. Research Language Center
IONIZATION OF THE UPPER ATMOSPHERE BY SHORT-WAVE SOLAR RADIATION [IONIZATSIIA VERKHNEI ATMOSFERY KOROTKOVOLNOVYM IZLUCHENIEM SOLNTSA]
Ivanov-Kholodnyi Bedford, Mass. AF Cambridge Res. Labs., Feb. 1963 35 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiia (Moscow) 2(4) 1962 p 674–687
(Contract AF 19(604)-8505)
(E-T-R-63-1; AD-415483) OTS: $3.60

Taking into account new data about the energy and spectrum of short-wave solar radiation, the absorption of radiation and the rate of ion-formation in the atmosphere at heights of 100 to 800 km were calculated for different times of the day. The peak of ion-formation was detected at a height of ~ 120 km, and the diurnal variation of h_e in the E, F1, and F2 regions was explained. The effect of the daytime increase in the density of the upper atmosphere (asymmetric with respect to midday) was examined; this made it possible to explain a number of ionospheric effects. Conclusions were drawn concerning the value of the effective coefficient of recombination. Author

29 SPACE SCIENCES

Includes space chemistry; cosmology; lunar and planetary exploration; and theoretical analysis of orbits and trajectories. *For space biology see*: 16 Life Sciences. *For related information see*: 05 Astronomy and Astrophysics; 12 Geophysics; and 22 Navigation and Guidance.

N64-11469 Aerospace Corp., El Segundo, Calif. Systems Research and Planning Div.
ERGODIC THEORY, DIOPHANTINE APPROXIMATION, AND CERTAIN STOCHASTIC SATELLITE PROBLEMS
C. M. Price 15 Jul. 1963 16 p refs
(Contract AF 04(695)-169)
(SSD-TDR-63-234; TDR-169(3550-01)TN-4; AD-423880)

Given is an initial configuration of satellites in their orbits. Of interest are the following problems: (1) subsatellite point of at least one of the satellites in the system falls within a designated area on the surface of the earth; (2) all of the satellites are simultaneously clustering around their respective southernmost points. In order to define and calculate the probability of events of this nature, and see how this probability varies as a function of the initial conditions, known results from ergodic theory and diophantine approximation are applied. Author

N64-11501* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
FREE RETURN CIRCUMLUNAR TRAJECTORIES FROM LAUNCH WINDOWS WITH FIXED LAUNCH AZIMUTHS
Francis Johnson, Jr. [1963] 12 p Presented at the AIAA Astrodynam. Conf., 19–21 Aug. 1963, Yale U., New Haven, Conn.
(AIAA Paper 63-406) AIAA: $0.50 members, $1.00 nonmembers

A comprehensive picture is presented of the factors determining the length of panes (GO periods are discrete elements of the overall launch window and are referred to as window panes) in terms of parking orbit launch time, the variation of injection conditions within different panes, and the variation of the characteristics of all attainable free return circumlunar trajectories within different panes. R.T.K.

N64-11505* National Aeronautics and Space Administration, Washington, D.C.
AN INSIGHT TO THE SCOPE OF THE NATIONAL SPACE EXPLORATION PROGRAM
DeMarquis D. Wyatt *In its* Conf. on Space, Sci., and Urban Life, Oakland, Calif., Mar. 28–30, 1963 p 11–25 (See N64-11502 03-01) GPO: $1.75

An attempt was made to clearly illustrate the interrelationships of the national space exploration program by grouping missions along a geographical base in the case of space exploration, and by a discussion concerning application satellites. Near-earth exploration, and lunar and planetary missions are examined. C.L.W.

N64-11551* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYTICAL STUDY OF LUNAR LANDING TRAJECTORIES WITH REFERENCE TO THE LUNAR-ORBIT-RENDEZVOUS MODE AND POSSIBLE ABORT SITUATIONS
James L. Williams and L. Keith Barker Washington, NASA, Dec. 1963 32 p refs

Landing trajectories from parking orbits at altitudes of 50 international statute miles and 100 international statute miles were computed, and abort capabilities near lander touchdown were studied by consideration of relative angular separation of the orbiter and lander at touchdown. All the landing trajectories utilized two thrusting periods—one to deorbit and another for braking to lunar surface with zero velocity. Also studied were landing trajectories wherein the lander is placed in a trajectory which has a period equal to that of the parking orbit. Author

N64-11575 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
ON THE PRESENCE OF RESONANCE PHENOMENA IN THE MOTIONS OF A SATELLITE, RESULTING FROM ITS SHAPE AND THE FORM OF ITS ORBIT
V. T. Kondurar' Mar. 1963 21 p refs Transl. into ENGLISH of an article from Astron. Zhur. (Moscow), v. 39, no. 6, p 1112–1123
(MH-Transl.-431)

This paper is a continuation of one, in which the influence of the shape of a sputnik on its rotational motion around the center of mass, and on the motion of the center of mass, was considered. In the present paper, in order to consider motions closer to reality, the circular Keplerian motions of the center of mass are replaced by elliptical ones, and the influence of the form of the undisturbed orbit on the motion of the sputnik is taken into account. It is assumed that the sputnik has an axial-symmetrical density distribution. Classical developments of celestial mechanics for polar coordinates of elliptical motion are used, and differential equations with periodic coefficients of the Hill type are solved. Author

N64-11576 Minneapolis-Honeywell Regulator Co., Minn. Military Products Group
THE MOMENT OF THE GRAVITY FORCES, ACTING ON THE SATELLITE
A. I. Lur'e [1963] 7 p refs Transl. into ENGLISH of an article from Prikl. Matemat. i Mekh. (USSR), no. 2, 1963 p 377–378
(MH-Transl.-458)

A direct derivation, leading to relatively short formulas, is presented for the computation of the moment of forces acting on a satellite in the gravity field of a geoid. P.V.E.

N64-11650* National Aeronautics and Space Administration, Washington, D.C.
RADIATIVE TRANSFER IN THE ATMOSPHERES OF VENUS AND MARS
R. Jastrow and S. I. Rasool [1962] 14 p refs Presented at the 3rd COSPAR Space Sci. Symp., Wash., D.C. 30 Apr.–9 May 1962

An approximate theory of radiative transfer in planetary atmospheres is developed and applied to atmospheres of Venus and Mars. The results for Venus indicate that the atmosphere of that planet must have an optical thickness of 60 in the infrared, corresponding to a transmission of 10^{-26}, in order to produce the observed surface temperature of 600° K. The surface temperature and tropopause height of Mars are also investigated. Author

N64-11666* National Aeronautics and Space Administration, Washington, D.C.
CERTAIN PROBLEMS OF STUDYING AND MASTERING COSMIC SPACE
N. M. Sisakyan, V. V. Parin, V. N. Chernigovskiy, and V. I. Yazdovskiy *In its* Prob. of Space Biol., Nov. 1963 p 3–15 (See N64-11665 03-01) OTS: $7.00

The evolution of space biology and its main problems are briefly discussed under three headings: (1) factors due to the intrinsic condition of flight dynamics of the space vehicle (e.g., accelerations, vibrations, weightlessness); (2) factors due to the nature of the ambient space (e.g., electromagnetic and corpuscular radiations, composition and thermal state of space); (3) factors created by the exposure of human beings to the artificial environment of the space ship (isolation, confinement to restricted space, different diet, and different rhythm of life). The importance of the more fundamental and general aspects of space biology, relating to the evolution of life, and the possibility of transplanting various forms of life from one celestial body to another are also briefly discussed. Author

N64-11738 Aerospace Information Div., Library of Congress, Washington, D.C.
ARTIFICIAL SATELLITE MOTION AND ELLIPTIC ORBIT PARAMETERS
6 Dec. 1963 8 p refs Review of 3 Russian articles
(*Its* A. I. D. Press, v. 2, no. 113) OTS: $1.10 ph, $0.80 mf

Variations of orbit elements are discussed and osculating orbits studied. The nonspherical shape of the earth is taken into consideration, and satellite motion is studied in terms of a nonspherical model of the earth. Author

N64-11811* Smithsonian Astrophysical Observatory, Cambridge, Mass.
FORMULAE AND TABLES FOR THE COMPUTATION OF LIFETIMES OF ARTIFICIAL SATELLITES
Luigi G. Jacchia and Jack Slowey 16 Sep. 1963 26 p refs (NASA Grant NsG-87-60)
(NASA CR-55058; SAO Special Rept. 135) OTS: $2.60 ph, $0.98 mf

A simple empirical formula is found to fit the computed values of L_e/L_0, where L_0 is the lifetime of a satellite in a circular orbit of radius r_0, and L_e is the lifetime of a satellite in eccentric orbit with perigee distance equal to r_0. The formula eliminates the singularity gap for low values of orbital eccentricity that makes existing formulae unwieldy in that region. Tables for the quick computation of atmospheric drag, and lifetime tables, are given. Author

N64-11906* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DUST BOMBARDMENT ON THE LUNAR SURFACE
Curtis W. Mc Cracken and Maurice Dubin (NASA, Wash.) Washington, NASA, Dec. 1963 25 p refs Presented at the Lunar Surface Mater. Conf., Boston, 21–23 May 1963 Submitted for Publication
(NASA TN D-2100) OTS: $0.75

A porous, low-density surface layer, consistent with photometric and radiometric observations, is assumed to exist on the

moon, and the effects of the impacting dust particles are considered. The interplanetary particulate material accreted by the moon amounts to approximately 1 gm/cm^2 for dust particles with masses less than 10^4 gm if the flux has remained constant during the past 4.5×10^9 yr. This value for the accretion rate represents a lower limit if the flux has decreased appreciably since the time of formation of the major lunar surface features. The porous surface layer acts as a protective covering against hypervelocity impacts of small dust particles, and inhibits the production of high-speed spray particles which could escape from the moon. The surface layer therefore consists of a mixture of lunar and interplanetary material. The hypervelocity impacts of dust particles constitute an effective mechanism for development and maintenance of a dendroid surface layer of high porosity and low density. Author

N64-11942 Douglas Aircraft Co., Inc., Santa Monica, Calif. Missile and Space Systems Div.
MODEL ATMOSPHERES FOR THE PLANET MARS
D. C. Evans and P. E. Wasko Aug. 1963 61 p refs
(SM-44552)

Four model atmospheres for the planet Mars are presented for use in engineering studies. Three are for a molecular weight of 28.0 with surface pressures of 85, 162, and 37 mb. They are representative of mean, maximum, and minimum conditions, respectively. The fourth model is for a molecular weight of 32.8 with a surface pressure of 37 mb, representing extreme minimum conditions. These models indicate the expected numerical range of the thermodynamic variables—pressure, temperature, and density—to be encountered in the Martian atmosphere from 0 to 400 km (1,312,300 ft) during the 11-year solar cycle, 1975 to 1985. The extreme atmospheric models are not artificial envelopes of all possible combinations, but represent physical conditions which may actually exist on Mars. Author

N64-11966 Joint Publications Research Service, Washington, D.C.
EXPERIMENTAL INVESTIGATION OF HEAT EXCHANGE OF A DISK AND A SCREEN
N. I. Nikitenko *In its* J. of Eng. Phys. [Minsk] v. 6, no. 6, Jun. 1963 17 Dec. 1963 p 1–11 refs (See N64-11965 03-01) OTS: $3.50

An experimental investigation of convective heat exchange between a gas-turbine disk and a screen, by use of a generalized steady-state process, is discussed. The experimental results are worked out in terms of the function Nu = f(Re)—Nu = the heat-exchange Nusselt number—and a gradientless distribution in the disk and screen is presupposed. P.V.E.

N64-12033* Martin Co., Baltimore, Md.
FEASIBILITY STUDY OF TWO-BODY MIDCOURSE GUIDANCE Final Report
Sept. 1963 156 p refs
(NASA Contract NAS1-2501)
(NASA CR-55031; ER-13138) OTS: $11.50 ph, $4.88 mf

The feasibility of guiding a spaceship, with high accuracy and reasonable fuel expenditure, in cislunar space by means of two-body equations is demonstrated. The technique presented computes a two-body trajectory using an appropriate virtual mass fixed on the earth-moon line to replace the combined effects of the earth and moon. On approach to either earth or moon, the virtual mass is located at the center of the target body and the magnitude is adjusted to correct for the in-plane variation in the actual pericenter radius. The out-of-plane distortion is simply cataloged as the change in the integrated trajectory inclination relative to the moon's orbital plane from any initial point to pericenter. It is demonstrated that for all trajectories studied, the virtual mass location on the earth-moon line depends only on the gravispheric surfaces upon which the initial and final points lie, regardless of the inclination, flight time or energy of the trajectory between the two surfaces. P.V.E.

N64-12187 Aerospace Corp., El Segundo, Calif. Systems Research and Planning Div.
SOME METHODS FOR QUICKLY ESTABLISHING ORBITAL SYSTEMS
H. K. Karrenberg 8 Nov. 1963 20 p refs
(Contract AF 04(695)-269)
(TDR-269(4526-20)-1; SSD-TDR-63-189; AD-424505)

This paper analyzes four methods for establishing orbital satellite systems in which all the satellites are equally spaced in one circular orbit. These methods are then compared on the basis of time required to establish the system and propulsion requirements. The Fast Pinwheel Method is found to be the quickest but also the most expensive in terms of velocity requirements. Author

N64-12266 Centro Di Studio Per La Fisica Delle Microonde, Florence (Italy)
RESEARCH ON METEOR TRAIL ECHOES Technical Report
N. Carrara, P. J. Checcacci, A. Consortini, M. E. de Langer, and L. Ronchi Sep. 1963 30 p refs
(Contract AF-61(052)-592)
(AFCRL-63-787; AD-423411)

The status of the research in the meteor field performed at the Centro Microonde of C.N.R., Florence, Italy, is described. Some results which are reported about the meteor flow have been derived from experimental data. Author

N64-12274 RAND Corp., Santa Monica, Calif.
PARAMETRIC LIMITS FOR THE UPPER ATMOSPHERE OF MARS
G. F. Schilling Nov. 1963 52 p refs
(Contract AF 49(638)-700; Proj. RAND)
(RM-3885-PR; AD-423922)

Probable upper and lower limits are calculated for the distribution of atmospheric pressure and mass density in the upper atmosphere of Mars. The three self-consistent model atmospheres (Tentative Maximum, Tentative Minimum, and Tentative Standard) should bracket actual conditions in the Martian atmosphere up to 500-km altitude and, above that, plausibly represent the extreme range of probable conditions. At any specific altitude level, the true daily mean values prevailing during any season over middle and low latitudes should fall between these limits. If no specific season, time of day, or latitude is specified, the Tentative Standard Atmosphere will estimate, in orders of magnitude for the whole altitude range, those pressures and densities that will probably occur more often than not. Author

N64-12290 Comstock and Wescott, Inc., Cambridge, Mass.
THERMAL ANALYSIS OF THE AFCRL SCANNING SPECTROMETER FOR THE S-57 ORBITING SOLAR OBSERVATORY SATELLITE (OSO-C)
Leon L. Olbrys 12 Jul. 1963 65 p refs
(Contract AF 19(604)-7496)
(AFCRL-63-700; AD-422480)

The analysis was performed by dividing the spectrometer into a number of discrete zones and obtaining an instantaneous heat balance equation for each zone. The resulting equations

were then lumped together to constitute a single differential equation defining the mean temperature of the complete spectrometer during the day phase of the orbit, and a similar equation for the night phase. Simplified equations were developed to determine the stabilization temperature of each isolated zone and for the complete spectrometer. A comparison was made between these results and the results obtained using an IBM-7090 computer. The latter results depict the orbital temperature, temperature fluctuation, and number of orbits required for the stabilization temperature to occur. Author

N64-12328 United States Naval Postgraduate School, Monterey, Calif.
ORBITAL TRANSFER WITH MINIMUM FUEL
W. E. Bleick and F. D. Faulkner Sep. 1963 14 p refs
(*Its* Res. Paper 40; AD-425513)

The method which was applied to the problem of scheduling the direction of constant momentum thrust of a rocket, which loses mass at a constant rate so that it transfers to a known earth-satellite orbit in minimum time after launching, was extended to solve the problem of orbital transfer of such a rocket with a minimum of fuel consumption. A numerical solution was obtained, using rectangular coordinates, for the case of fixed launching conditions. R.T.K.

N64-12349* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PERIODIC TRAJECTORIES PASSING NEAR BOTH MASSES OF THE RESTRICTED PROBLEM OF THREE BODIES
R. F. Arenstorf [1963] 20 p refs Presented at the 14th Intern. Astronautical Congr., Paris, 25 Sep.–Oct. 1963
(IAC Paper 64)

The planar restricted problem of three bodies with small mass ratio is considered, and the periodic solutions of the so-called second kind, whose existence has been mathematically shown just recently are discussed. By specialization these lead to the trajectories regarded in the title. Investigation of certain exceptional cases results in branch points, from which several real analytic families of solutions with the properties of the title originate. The existence of these new "periodic solutions of the second kind of higher order" can also be made numerically evident, and several examples are given, the last one being of particular interest for astronautical applications in the earth–moon system. Finally, a new simultaneous regularization at both masses of the title problem is given, which is not only required for studying the above branch points but is also of interest for other theoretical and numerical investigations. Author

N64-12404* California U., Berkeley Space Sciences Lab.
POSSIBLE ORIGIN OF THE LUNAR WALLED PLAIN PTOLEMAEUS
R. G. Strom and A. Palm Repr. from Nature, v. 199, no. 4898, 14 Sep. 1963 p 1052–1054 refs
(NASA Grant NsG-145-61)

Ptolemaeus is one of several aligned large craters or walled plains located along the border of Mare Nubium. The tectonic relationships between the Ptolemaean ghost features and the Imbrium radial system suggest that the formation of Ptolemaeus may have been contemporaneous with that of Mare Imbrium and that its evolution possibly proceeded in the following stages: (1) subsidence of a segment of crust containing preexisting structures; (2) formation of craters and related features within the subsided area; (3) inundation of the existing structures by lava and dust; and (4) formation of post-lava craters. I.v.L.

30 SPACE VEHICLES

Includes launch vehicle-spacecraft combinations; missile systems; operating problems; safety devices; and stability and control. *For boosters and launch vehicles see*: 31 Space Vehicles (Launch Vehicles). *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

N64-11470 Aerospace Corp., El Segundo, Calif. Labs. Div.
ELECTRONICS PROGRAM, SATELLITE ATTITUDE CONTROL SYSTEM EXPERIMENTS Semiannual Technical Report, 1 Jan.–30 Jun. 1963
D. J. Griep and J. G. Zaremba 21 Oct. 1963 37 p refs
(Contract AF 04(695)-169)
(SSD-TDR-63-228; TDR-169(3250-32)-TN-1; AD-423888)

Primary effort was devoted to the evaluation and initial operation of the single-axis wire-supported space-vehicle simulator. A bang-bang attitude control system was implemented to aid in the evaluation of the simulator, and a new draft-free enclosure was constructed to house the simulator. Two pieces of special purpose test equipment, a sun sensor and a light source, were designed and fabricated. Author

N64-11554* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC INVESTIGATION OF A PYRAMIDAL REENTRY CONFIGURATION WITH CAMBERED VARIABLE-SWEEP WINGS AND VARIOUS LONGITUDINAL CONTROLS
Bernard Spencer, Jr. Washington, NASA, Dec. 1963 57 p refs
(NASA TN D-2033) OTS: $1.50

An investigation has been conducted at Mach numbers from 0.40 to 1.13 on a blunted right-triangular pyramidal-type lifting-body configuration having wing-panel sweeps of 0°, 20°, 40°, 60°, and 80°. Included in this investigation were tests of this configuration in combination with a body trailing-edge flap control, or a canard control. The effects of deflecting afterbody flaps to simulate base boattailing are also included. Author

N64-12034 Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
7208 BLADE STRAP LOAD ANALYSIS
Paul R. Schrantz 29 Oct. 1963 8 p
(SSE-5-164)

Load calculations are given for the loading conditions imposed on the X258 rocket case by the forward and aft straps which are mounted on the case. Forward-strap load calculations are radial pressure due to strap preload, radial pressure due to 3.75-inch expansion on the diameter of the rocket case, and the radial load due to 20-lb tension in despin cables. Aft-strap load calculations are radial pressure due to strap preload, radial pressure due to 0.080-inch expansion on the diameter of the rocket case, and radial load due to blade displacement. C.L.W.

N64-12064* National Aeronautics and Space Administration. Washington, D.C.
NUCLEAR ROCKET PROGRAM REVISED News Release 63-285
24 Dec. 1963 5 p
Available from NASA. Offices of Scientific and Technical Information, Wash., D.C.

NASA and AEC announce the revision of the ROVER program, this country's nuclear-rocket-propulsion program. The revised program places the emphasis on ground-based research and engineering and defers the further development of flight systems. This means that ROVER's Kiwi (ground reactor) project is unchanged, that NERVA will be continued but with its flight objectives deferred, and that RIFT is cancelled. The major elements of this revised program include a continuation of advanced technical development, completion of the Kiwi reactor effort and its phasing over to the higher-powered Phoebus system, and redirection of the NERVA project. I.v.L.

N64-12099* Douglas Aircraft Co., Inc., Santa Monica, Calif. Missile and Space Systems Div.
DESIGN EVALUATION/QUALIFICATION TEST OF LINEAR-SHAPED CHARGE MANUFACTURED BY THE ENSIGN BICKFORD PRODUCT DIVISION OF DARWORTH, INC., P/N FLSC-B-100-AL-J MODEL NO. SATURN S-IV
S. Greene, J. Hilman, and E. P. Walther 26 Mar. 1963 128 p
(NASA Contract NAS7-1)
(NASA CR-55071; SM-42678) OTS: $10.10 ph, $4.04 mf

This report describes the design evaluation–qualification tests conducted on a cyclotrimethylene trinitramine (RDX) flexible linear-shaped charge used in the command destruct system of the Saturn S-IV stage. The charge is employed to rupture the S-IV fuel and oxygen tanks in the event that a serious inflight malfunction requires flight termination. Tests performed established charge parameters and provided data for its optimum usage. Author

N64-12107* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AERODYNAMIC HEATING OF CONICAL ENTRY VEHICLES AT SPEEDS IN EXCESS OF EARTH PARABOLIC SPEED
H. Julian Allen, Alvin Seiff, and Warren Winovich Washington, NASA, Dec. 1963 99 p refs
(NASA TR R-185) OTS: $2.25

The aerodynamic heating characteristics during earth atmosphere entry at speeds greater than earth parabolic speed are calculated for vehicles of conical shape. Ablative heat shields are assumed for these bodies, and both laminar and turbulent boundary layers are considered. It is shown that, if conical shape can be maintained, an optimum cone angle will exist, and a cone of this angle will be superior to the more usual blunt entry shapes at speed well in excess of parabolic speed. The improvements result from the fact that radiative heat-transfer contributions from the shock layer are much reduced for the cones so that, although the convective contributions are increased, a net gain is realized. For optimum cones, the approximate analysis indicates that the convective contributions constitute 85 to 90 percent of the total heating. Solutions to the problem of maintaining conical shape as ablation progresses are considered, and some experimental demonstrations of means for accomplishing this are presented. Author

N64-12161* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AN INVESTIGATION OF VARIOUS PARAMETERS AFFECTING THE STRUCTURAL WEIGHT OF ROCKET VEHICLE NOSE CONES
Clyde D. Nevins and Benny W. Helton 17 Oct. 1963 48 p refs
(NASA TM X-50988; MTP-P&VE-S-63-4) OTS: $4.60 ph, $1.64 mf

A series of externally pressure loaded, semimonocoque cones, with various diameters and cone angles, were proportioned for minimum weight. The investigation was conducted to determine the cone half angle which yielded the minimum weight for a given base diameter and trajectory. In addition, the effects of alternate construction materials and blunting was investigated. An electronic computer program was devised to make the weight optimization study. The computer results show that the cone angle producing the least weight is independent of the cone base diameter, aluminum alloy cones are lighter than fiberglass, and blunting is advantageous. Author

N64-12163* Douglas Aircraft Co., Inc., Santa Monica, Calif.
THE FEASIBILITY OF MANNED ORBITAL MAINTENANCE
K. L. Cains 31 Jan. 1962 23 p refs
(NASA Contract NAS7-1)
(NASA CR-55072; SM-41449) OTS: $2.60 ph, $0.89 mf

This report is the result of a literature search. It is primarily concerned with man in the extraterrestrial environment. It describes many of the prime factors that will influence the use of man in an orbital repair system. Physical, psychological, physiological, and mechanical problems are discussed. Recommendations are presented which are pertinent to the design of system, components, and procedures for the efficient preparation and utilization of the orbital maintenance man. Author

31 SPACE VEHICLES (LAUNCH VEHICLES)

Includes boosters; clustered rockets; and multistage rockets. *For propulsion engines see*: 27 Propulsion. *For manned space capsules, satellites, and sounding rockets and space probes see*: 32 Space Vehicles (Spacecraft). *For launch vehicle-spacecraft combinations see*: 30 Space Vehicles. *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

N64-12116 Aerojet-General Corp., Sacramento, Calif. Advanced Development Div.
OPERATION SEA DRAGON
Neil E. Harkleroad Feb. 1963 99 p Presented at the ASME Aviation and Space, Hydraulic, Gas Turbine Conf. and Products Show, Los Angeles, 3–7 Mar. 1963
(Rept. 8280-1S)

The increasing national interest in examining the possible types of launch vehicles that could follow the Advanced Saturn (Saturn C-5) has produced a variety of designs all much larger in size. These Post-Saturn vehicles, in general, utilize high performance engines and structures in an attempt to reduce the launch to payload weight ratio. This paper suggests that a simple, large, recoverable vehicle that de-emphasizes sophisticated performance in exchange for ease of development, increased reliability, and reduced program costs can meet the mission performance and could be the better launch vehicle for the lunar colony support and planetary explorations of the 1970's. Author

32 SPACE VEHICLES (SPACECRAFT)

Includes manned space capsules; satellites; and sounding rockets and space probes. *For boosters and launch vehicles see*: 31 Space Vehicles (Launch Vehicles). *For launch vehicle-spacecraft combinations see*: 30 Space Vehicles. *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

N64-11646 National Weather Satellite Center, Washington, D.C.

REDUCTION AND USE OF DATA OBTAINED BY TIROS METEOROLOGICAL SATELLITES

Geneva, World Meteorol. Organ., Feb. 1963 69 p refs (Tech. Note 49; WMO-131-TP-58) Available from WMO Secretariat, Geneva: 6 Sw. Fr.

The TIROS series of meteorological satellites is equipped with television camera systems to obtain pictures of clouds, and radiometers to measure radiation reflected and emitted by the earth and its atmosphere. The television-type pictures relayed to the ground show clouds, sea ice, snow cover, sun glint, and geographic features. Radiation measurements are made in the visible and infrared regions. In general, large-scale synoptic patterns are clearly revealed in the cloud pictures. Smaller scale features, such as cellular convection, are also seen. It has been apparent from the first that the cloud pictures can be used to complement analyses based on conventional data, and are particularly useful for filling the observational voids of the largely unobserved oceans and the sparsely populated regions of the earth. The pictures are used as the basis for nephanalyses which are distributed worldwide in coded form with some limited distribution by facsimile. These nephanalyses are used in central analysis, aircraft flight briefings, storm warnings, etc. Author

N64-11656 National Weather Satellite Center, Washington, D.C. Meteorological Satellite Lab.

AN INVESTIGATION OF METEOROLOGICAL SATELLITE CHARACTERISTICS FOR CONTINUOUS EARTH COVERAGE

Thomas I. Gray, Jr. and S. Fred Singer Jul. 1963 49 p refs (MSL-19)

A systems analysis of orbital, optical, and meteorological characteristics of weather satellites in polar orbits shows that the ratio of the area viewed to the total earth area, in one day, becomes a maximum in the altitude range of 1000 to 2400 nmi (0.3 to 0.7 earth radii). Frequency of viewing increases rapidly with latitude; if more frequent looks are required in the tropical zones, then an equatorial satellite can supplement a polar satellite system very effectively. In principle, complete coverage could be obtained through a multiple satellite system: e.g., with two satellites in perfect synchronization. But, in practice, with random (nonsynchronous) orbits only a maximum probability of coverage can be obtained. Various useful expressions are derived and presented in graphical and tabular form showing the "worth" of a picture, as well as the uniformity of resolution, location errors, and similar operational parameters, as a function of satellite altitude and picture format. The highest "worth" is obtained from a satellite in a 1500 nmi polar orbit. Author

N64-11728* North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.

SELF-DEPLOYING SPACE STATION Final Report

L. M. Tinnan and E. A. Weber 31 Oct. 1962 162 p (NASA Contract NAS1-1630)

(NASA CR-52907; SID-62-1302) OTS: $12.00 ph, $5.06 mf

The 6-month feasibility study of a Self-Deploying Space Station (SDSS) concept included the design and construction of a 1/10-scale model of the selected SDSS vehicle configuration. It was intended that the model be fully automatic (i.e., self-deploying), and that the deployment mechanism be similar to that which would be used on a full-sized space station. The primary objective of this final report is to describe those additional activities relating to the design, construction, and operation of the 1/10-scale deployment model. It also contains a section describing problem areas which should be given particular consideration in the subsequent development of the SDSS. Author

N64-11731* National Aeronautics and Space Administration, Washington, D.C.

Statement [GEMINI PLANNING BOARD]

Robert C. Seamans, Jr. [1963] 3 p

Available from NASA. Office of Scientific and Technical Information, Wash., D.C.

A discussion is presented of the key elements of the Gemini Agreement between NASA and the Department of Defense. R.T.K.

N64-11778* National Aeronautics and Space Administration, Washington, D.C.

NEXT TIROS TO CARRY EXPERIMENTAL WEATHER CAMERA News Release No. 63-269

13 Dec. 1963 15 p

Available from NASA. Office of Scientific and Technical Information, Wash., D.C.

According to NASA, plans are underway to launch the eighth TIROS meteorological satellite. This satellite will carry an experimental camera subsystem (Automatic Picture Transmission) designed to give meteorologists instantaneous photographs of cloud patterns. Unlike the television subsystem carried in the early TIROS satellites, Automatic Picture Transmission transmits pictures on the slow-scan principle similar to that used to send radio photographs. This experimental camera subsystem is being tested for the first time aboard this TIROS satellite. R.T.K.

N64-11779* National Aeronautics and Space Administration, Washington, D.C.

NASA TO LAUNCH AIR DENSITY EXPLORER News Release No. 63-271

17 Dec. 1963 12 p

Available from NASA. Office of Scientific and Technical Information, Wash., D.C.

Plans are underway to launch the inflatable, spherical satellite, Air Density Explorer, by a Scout vehicle, according to an announcement from NASA. The objectives of the mission are: (1) to extend upper-atmosphere air-density studies to the polar regions and to determine density and temperature of the atmosphere at various latitudes; (2) to measure flight performance of the X-258 fourth stage of the Scout launch vehicle; and (3) to test recent modifications to the Scout launch vehicle's hydrogen peroxide control system. R.T.K.

N64-11794* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PRELIMINARY RESULTS FROM THE VLF RECEIVER ABOARD CANADA'S ALOUETTE SATELLITE

R. E. Barrington and J. S. Belrose (Defence Res. Telecommunications Estab.) [1963] 14 p Submitted for Publication (NASA TM X-51251; NASA X-615-63-36) OTS: $1.60 ph, $0.80 mf

VLF observations made aboard the Alouette satellite are analyzed. This analysis reveals some very interesting features of whistlers and ionospheric noise as observed in the ionosphere. In addition, some comparisons of simultaneous observations of the VLF band, from the ground and in the satellite, are made. I.v.L.

N64-11799* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SCIENTIFIC RESULTS OF OSO-1

John C. Lindsay [1963] 34 p refs Presented at AIAA/CASI/RAeS 9th Anglo-Am. Conf., 16–18 Oct. 1963

(NASA TM X-51258; NASA-X-614-63-210) OTS: $3.60 ph, $1.22 mf

The observations of the solar spectrum between 170 A and 340 A have shown that: (1) The He II (304 A) emission was enhanced by a factor of about 33% during a period when the Zurich Provisional Relative Sunspot Number increased from zero to a maximum of 94 and the 2800-mc flux varied from approximately 76 to 125 × 10^{-22} $wm^{-2}Hz^{-1}$. (2) The Fe XV (284 A) and Fe XVI (335 A) coronal lines were enchanced during the same period by a factor of approximately four. (3) The enhancement of He II, Fe XV and Fe XVI due to plage activity was larger than enhancements due to flares that occurred during the three-month interval of observations. (4) The variations in intensity of the He II, Fe XV, and Fe XVI represent the extremes observed; averaging of sixty of the reliably observed lines between 171 A and 342 A gives an enhancement of between 50% and 80% for the time interval 9 March to 23 March 1962. (5) Although there appears to be a gross correlation between solar activity indices (such as 2800-mc flux) and the He II, Fe XV and Fe XVI fluxes, there are no indications that the relative prominence of the spectral lines may depend upon the age of the center of activity. P.V.E.

N64-11893* Space Technology Labs., Inc., Redondo Beach, Calif.

THE DESIGN OF THE ATTITUDE CONTROL SYSTEM FOR THE ORBITING GEOPHYSICAL OBSERVATORY

D. D. Otten 14 Dec. 1962 30 p refs Presented at the 14th Intern. Astronautical Congr., Paris, 25 Sep.–1 Oct. 1963

(NASA Contract NAS5-899)

(IAC Paper 31; Rept. 2313-6006-MU000)

The attitude control system maintains one body axis of the satellite in alignment with local vertical. In addition, the angular orientation of the satellite body about local vertical is controlled, along with a single-degree-of-freedom solar array, to maintain the solar cells perpendicular to the sun's rays. Further, a package (OPEP) free to rotate with respect to the body about local vertical is kept at all times aligned in the orbit plane. Mission requirements are stated, and, from these, control laws for each of the five axes of control are deduced. Response requirements are then stated, and the foundation for the control system design is established. The sensors and control torque sources for the OGO ACS are described and their choice justified. The control system logic is presented, and the details of the control system design and sizing are given. Author

N64-11894 Radio Corp. of America, Princeton, N.J.

THE COMMUNICATION SATELLITE RELAY

W. A. Schreiner [1963] 40 p Presented at the 14th Intern. Astronautical Congr., Paris, 25 Sep.–1 Oct. 1963

(IAC Paper 81)

A description is presented of the subsystems of the Relay Satellite. The satellite is redundant in all of its subsystems except for the telemetry encoder. The principal mission of Relay is to determine the propagation characteristics of a low-altitude satellite repeater and to check the techniques of operating the supporting ground stations. The spacecraft carries, in addition to the transponders and the equipment needed to support them, a set of experiments designed to obtain data on particle radiation in space. Measurements are made of the flux density at various energy levels and of the effect of such radiation on solar cells and other semiconductor components. P.V.E.

N64-11895 Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.

THE DYNAMICAL DESIGN OF THE RELAY SATELLITE

Carl C. Osgood [1963] 23 p refs Presented at the 14th Intern. Astronautical Congr., Paris, 25 Sep.–1 Oct. 1963

(IAC Paper 137)

A general description is presented of the design, background development, and requirements of the Relay satellite. In particular, the control of vibratory-force transmissibility by the design of damping devices and conditions is discussed. P.V.E.

N64-11930 Goodyear Aircraft Corp., Akron, Ohio

INVESTIGATION OF DIELECTRIC MATERIAL FOR ERECTABLE LENSES [Final Report Jul. 1961–Jun. 1963]

A. L. Johnson and Y. E. Stahler Wright-Patterson AFB, Ohio, Defense and Transport Systems Eng., Oct. 1963 52 p refs (Contract AF 33(616)-8474)

(GER-11147; ASD-TDR-63-780; AD-418226) OTS: $3.60

Material-structure systems characterized by light weight, a dielectric constant of 3.6 to 4.0, low dissipative loss, and erectability from a compact state in an orbital environment, were investigated to implement a concept for a high-gain passive, nonoriented communications satellite based on covering a large diameter sphere with thin lens-reflector elements. A lens medium of a random maze of aluminum slivers in a plastic filament was selected as a practical system, and an inflatable element was built, electrically tested, and erected in a simulated orbital environment. Author

N64-11944 British Aircraft Corp., Stevenage (Gt. Brit.) Guided Weapons Div.

THE UK3/S53 INTERNATIONAL IONOSPHERIC SATELLITE – BRITAIN'S FIRST SPACECRAFT

J. L. Blonstein [1963] 71 p Presented at the 14th Intern. Astronautical Cong., Paris, 25 Sep.–1 Oct. 1963

(IAC Paper 136)

The UK3, the first spacecraft to be built in Britain, will be the third in a series of joint Anglo-American scientific research satellites. The planned launching date is 1966. The altitude of the circular orbit will be approximately 400 miles. The shape of the satellite and the form of the structure and equipment installation have been devised to suit the requirements of the experiments, while meeting the restraints of structural strength, thermal control, aerials, power supplies, installation, and access. The processes by which these requirements have been integrated are described. The experiments are to deal with: (1) the electron density; (2) the mapping of galactic noise sources; (3) a study of radio signals below 20 kc/s; (4) the atmospheric distribution of molecular oxygen; and (5) the intensity and distribution of natural terrestrial noise and anomalous radio propagation. I.v.L.

N64-12004 Radio Corp. of America, New York, N.Y.
TIROS METEOROLOGICAL SATELLITE REPORT
A. Schnapf [1963] 40 p refs Presented at the 14th Intern. Astron. Congr., Paris, 25 Sep.–1 Oct. 1963
(IAC Paper 91)

Seven TIROS meteorological satellites have been launched and orbited. These satellites have provided meteorologists with a nearly continuous supply of weather information from remote areas of the world. The following subsystems of the TIROS satellites are described: (1) the television camera; (2) infrared observation; (3) programing and control; (4) attitude reference; (5) dynamics control; (6) telemetry and tracking; and (7) power supply. A summary is given of the contributions of the TIROS satellites to weather observation, forecasting, and analysis. R.T.K.

N64-12029* Kansas U., Lawrence Center for Research in Engineering Science
A STUDY OF EARTH RADAR RETURNS FROM ALOUETTE SATELLITE Semi-annual Report [1 May-31 Oct. 1963]
Richard K. Moore [1963] 8 p refs
(NASA Grant NsG-477)
(NASA CR-52985) OTS: $1.10 ph, $0.80 mf

The ground returns observed by the Alouette topside-ionosphere sounder were studied. The data-processing plans and a statement of the data-reduction problem associated with returns from the Alouette satellite are discussed. Two theories were developed—one presents a refined approach to the randomly-located-facet theory of electromagnetic scatter from rough surfaces; the other utilizes a new autocorrelation function of surface heights to fit the lunar radar data of Evans and Pettingill, over a much wider range of angles than any theory has previously permitted. R.T.K.

N64-12055 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
FIRST IN THE WORLD GROUP FLIGHT IN COSMIC SPACE (BASIC RESULTS)
29 Nov. 1962 40 p Transl. into ENGLISH from Pravda (Moscow), no. 295(16151), Oct. 22, 1962 p 1–3
(FTD-TT-62-1578/1+2; AD-292620)

A description is given of the "cosmic group flight" of cosmonauts Nikolayev and Popovich in the spaceships Vostok-3 and Vostok-4. The following topics are discussed: (1) medical, biological, and technical problems of long-lasting group flight; (2) structural characteristics of Vostok-3 and Vostok-4; (3) control and measurements made during the flight; (4) radio and TV communication with Vostok-3 and Vostok-4; (5) measurements of penetrating radiation; (6) medical and biological problems—training of cosmonauts, microclimate in the cabin (i.e., carbon dioxide content), food and water, methods used for and the physiological investigations; (7) the execution of the group flight; and (8) basic results of the flight. R.T.K.

N64-12100 Smithsonian Astrophysical Observatory, Cambridge, Mass.
CATALOG OF PRECISELY REDUCED OBSERVATIONS NO. P-9
Phyllis Stern, comp. 30 Sep. 1963 97 p refs
(NASA Grant NsG 87-60)
(NASA CR-55089; SAO Spec. Rept. 137) OTS: $8.60 ph, $3.11 mf

The catalog contains precisely reduced observations of: (1) Satellite 1960γ2(Transit 1B) from May 7 through May 19, 1960; (2) Satellite 1960 ι1(Echo I) from August 12 through August 31, 1960; and (3) Satellite 1961δ1(Explorer IX) from July 1 through December 31, 1961. R.T.K.

N64-12159* National Aeronautics and Space Administration, Washington, D.C.
EXPLORER VI AND PIONEER V DATA. VOLUME 1: REDUCTION AND ANALYSIS OF DATA
Alan Rosen, Edward J. Smith, C. P. Sonett, Eugene W. Greenstadt, R. C. Gore, and W. C. Meecham (Space Technol. Lab., Inc., Redondo Beach, Calif.) Oct. 1963 198 p refs
(NASA Contract NASw-270)
(NASA CR-55104; NASA CR-3)

A study of the information obtained from the instruments on the Explorer VI earth satellite and the Pioneer V deep space probe is presented. The collection includes: a discussion of the structure, composition and dynamics of radiation belts; an analysis of the observations of the geomagnetic field during magnetic storms; a compilation of Pioneer V data reduction and analysis; and investigation of signal fading in the transmission of the satellites; and fluctuations in signal strength observed in signals received from the satellites caused by ionospheric irregularity. Author

N64-12189 Goodyear Aircraft Corp., Akron, Ohio
EVALUATION OF MODEL LENS-REFLECTOR-TYPE COMMUNICATIONS SATELLITE Technical Report [Oct. 1961-May 1963]
W. D. Wise et al Wright-Patterson AFB, Ohio, Aeron. Systems Div., Oct. 1963 80 p refs
(Contract AF 33(657)-7338)
(GER-11123, ASD-TDR-63-779; AD-424174)

A 5-ft-diam. spherical model of a unique design of a non-oriented high-altitude passive communications satellite was evaluated for monostatic and bistatic performance with vertical, horizontal, and circular polarizations from 2 to 8 kmc. The design utilized thin lens-reflector elements covering the sphere and having a diffraction-limited design beam width of 17 deg at 5 kmc. The model showed a substantial gain over a simple sphere, but exhibited large signal fluctuations. The fluctuations were dampened by placing the reflective elements on a 10-ft radius of curvature; this indicated the possibility of a constant return from a full-size design. Author

N64-12350 Hughes Aircraft Co., Culver City, Calif. Space Systems Div.
SYNCOM
F. P. Alder Sep. 1963 36 p Presented at the 14th Intern. Astronautical Congr., Paris, 25 Sep.–1 Oct. 1963
(Supported by NASA)
(IAC Paper 82)

The synchronous orbit active repeater satellite investigations of Project Syncom are discussed. Included are the characteristics of the synchronous orbit; Syncom orbit injection and control techniques; and the primary mission objectives and operation techniques of the Syncom I and the Syncom II spacecraft. C.L.W.

N64-12352 Radio Corp. of America, New York, N.Y.
TIROS OPERATIONS
A. Schnapf [1963] 40 p refs Presented at the 14th Intern. Astronautical Congr., Paris, 25 Sep.–1 Oct. 1963
(IAC Paper 91)

A description is presented of the progression of TIROS from an experimental program to a tool for operational weather observations. Future TIROS programs are also discussed. P.V.E.

N64-12391* National Aeronautics and Space Administration, Washington, D.C.
NASA'S RELAY 1 STILL GOING STRONG News Release No. 64-1
3 Jan. 1964 5 p
Available from NASA. Office of Scientific and Technical Information, Wash., D.C.

According to NASA, the built-in device which was supposed to have destroyed Relay I has not yet done its job. Relay I carries a timing device—an electrolytic solution which was supposed to have eaten through the main power lead to switch off the transmission power. Experts speculate that the temperature around the destruct device has been colder than anticipated and that the erosion has been slower. The reason for destroying Relay I's communications capability is to prevent possible interference with other satellites after its useful lifetime. During its lifetime, Relay I spanned oceans and continents with about 2,000 experiments. It transmitted teletype and voice messages, still photographs, and live television including color TV. It was also used successfully to transmit automatic data. E.K.R.

N64-12402* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE SITUATION REPORT, VOLUME 3, NO. 23
30 Nov. 1963 10 p
(NASA TM X-50510; NASA X-533-63-1) OTS: $1.10 ph, $0.80 mf

A satellite situation report is given which reflects data computed and compiled by the Goddard Space Flight Center, NORAD, and the Smithsonian Astrophysical Observatory as of 1200Z on November 30, 1963. C.L.W.

33 STRESSES AND LOADS

Includes fatigue; vibration; flutter; and structural tests. *For thermal stress see*: 13 Heat Transfer and Thermodynamics. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 34 Structural Design.

N64-11759 Polytechnic Inst. of Brooklyn, N.Y.
ON THE INFLUENCE OF INITIAL STRESS ON THE VIBRATIONS OF SIMPLY SUPPORTED CIRCULAR CYLINDRICAL SHELLS
Anthony E. Armenakas Oct. 1963 24 p refs
(Contract Nonr-839(17))
(PIBAL-673; AD-422449)

The influence of intial uniform circumferential and axial stress on the frequency of vibrations of simply supported, circular, cylindrical shells has been previously investigated on the basis of shell theories which can be anticipated to yield accurate results only for modes having a large number of circumferential waves. These theories, moreover, do not take into account the effect on the frequency of the change during deformation of the magnitude and direction of the applied load. In this investigation, a bending theory is employed in reexamining the influence of initial, uniform, circumferential and axial stress on the frequency of vibrations of simply supported, circular, cylindrical shells. The results are compared with those of previous investigations. Author

N64-11761 Battelle Memorial Inst., Columbus, Ohio Defense Metals Information Center
SOME OBSERVATIONS ON THE DISTRIBUTION OF STRESS IN THE VICINITY OF A CRACK IN THE CENTER OF A PLATE
L. R. Jackson 1 Sep. 1963 36 p refs
(Contract AF 33(6 6)-7747)
(DMIC-MEMO-178; AD-422463)

The primary purpose of this investigation was to make the results of Neuber's stress analysis more readily usable by those engaged in evaluating the crack sensitivity of materials. In the course of developing this information, the following features were observed: (1) While the more intense effect of a crack dies out rapidly near the crack tip, a measurable effect does persist over a great enough area that strain gages could be used to determine the extent to which Neuber's analysis could be applied to granular materials like metals and alloys. (2) Except in the immediate vicinity of the crack tip, the stress field is quite insensitive to crack geometry. Experimentally, however, it has been observed that the nature of the crack tip has a measurable effect on fracture loads and it has been found necessary to extend the length of the artificial-machined cracks by means of fatigue cracks in order to bring out differences between materials that otherwise might not be apparent. This observation might mean that Neuber's attention to the boundary conditions at the surface of the crack may make his method of analysis a more suitable baseline for deducing the nature of real materials than other, more simple methods that do not fulfill boundary conditions in the immediate vicinity of the crack. I.v.L.

N64-11803 Materials Research Lab., Inc., Richton Park, Ill.
APPLICATION OF FRACTURE MECHANICS TO ADHESIVE JOINTS. PART I – FRACTURE TOUGHNESS OF ALUMINUM-EPOXY-ALUMINUM JOINTS IN A G_I MODE Final Report
R. L. Patrick (Alpha Res. and Develop., Inc.), E. J. Ripling, and S. Mostovoy Nov. 1963 50 p refs
(Contract Nonr-3544(00)(X))
(MRL-TM-241 Pt. I; AD-424287)

CONTENTS:

Part 1. FRACTURE TOUGHNESS OF ALUMINUM-EPOXY-ALUMINUM JOINTS IN A G_I MODE E. J. Ripling, S. Mostovoy, and R. L. Patrick p 1–24 refs (See N64-11803 03-33)

Part 2. A METHOD FOR MEASURING THE FRACTURE TOUGHNESS OF ADHESIVE JOINTS E. J. Ripling, S. Mostovoy, and R. L. Patrick p1–21 refs (See N64-11804 03-33)

Part 3. THE EFFECT OF SOME MISCELLANEOUS VARIABLES ON FRACTURE TOUGHNESS E. J. Ripling, S. Mostovoy, and R. L. Patrick p 1–3 (See N64-11805 03-33)

N64-11804 Materials Research Lab., Inc., Richton Park, Ill.
A METHOD FOR MEASURING THE FRACTURE TOUGHNESS OF ADHESIVE JOINTS – PART 2
E. J. Ripling, S. Mostovoy, and R. L. Patrick *In its* Appl. of Fracture Mech. to Adhesive Joints Nov. 1963 p 1–21 refs (See N64-11803 03-33)

The techniques developed for measuring the fracture toughness of homogeneous materials are not applicable to heterogenous systems. This report describes a method for measuring this property in adhesive joints, for both an opening (G_{Ic}) and forward shearing fracture mode (G_{IIc}). The sample shape and the effect of modifications in geometry are discussed. A stiff loading system which permits excellent control are discussed. A nomograph is included in the report which enables the determination of G_{Ic} and crack length from the variables obtained in the test, i.e., compliance and critical load for crack propagation.

The measurement of G_{IIc} is also discussed, and the much simpler equations for its determination are given, as well as test data comparing G_{Ic} and G_{IIc}. Author

N64-11805 Materials Research Lab., Inc., Richton Park, Ill.
THE EFFECT OF SOME MISCELLANEOUS VARIABLES OF FRACTURE TOUGHNESS – PART 3
E. J. Ripling, S. Mostovoy, and R. L. Patrick *In its* Appl. of Fracture Mech. to Adhesive Joints Nov. 1963 p 1–3 (See N64-11803 03-33)

In addition to measuring the effect of bond thickness and opening rate on G_I and G_{II} toughness, the effect of temperature, humidity, and surface roughness on G_I for the aluminum-epoxy-aluminum system was also perfunctorily evaluated. Tests were also conducted in which the effect of a combination of tension and shear on G_{Ic} was studied, and in still another test series, the fracture toughness (G_{Ic}) of glass-epoxy-glass was measured. Author

N64-11901* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF DIFFERENTIAL PRESSURE, THERMAL STRESS, AND BUCKLING ON FLUTTER OF FLAT PANELS WITH LENGTH-WIDTH RATIO OF 2
Sidney C. Dixon and Charles P. Shore Washington, NASA, Dec. 1963 20 p refs
(NASA TN D-2047) OTS: $0.50

Flat single-bay skin-stiffener panels with length–width ratios of 2 were tested at a Mach number of 3.0 and at various dynamic pressures, stagnation temperatures, and differential pressures in order to determine some of the effects of thermal stress, differential pressure, and buckling on the flutter characteristics of elastically restrained panels. Two distinct flutter boundaries were obtained, one associated with standing-wave flutter and the other with traveling-wave flutter. Standing-wave flutter usually occurred when the differential pressure Δp was less than 0.10 psi; traveling-wave flutter usually occurred when Δp was greater than 0.15 psi and the direction of the loading was toward the cavity behind the panel. The flutter trends indicated by both boundaries were similar to experimental trends obtained previously for thermally stressed panels with length–width ratios from 0.96 to 10. The standing-wave flutter results are compared with theory for the condition of zero midplane stress. Author

N64-11902* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPARATIVE EVALUATION OF METHODS FOR PREDICTING FLUTTER AND DIVERGENCE OF UNSWEPT WINGS OF FINITE SPAN
E. Carson Yates, Jr., and Samuel R. Bland Washington, NASA, Dec. 1963 55 p refs
(NASA TN D-2051) OTS: $1.50

For the subsonic range, the methods examined included a modified strip analysis, two-dimensional loading modified to account for finite planform, and the subsonic kernel function. These methods all appeared to predict flutter speeds satisfactorily for Mach numbers below about 0.75, but, in the high subsonic range, the kernel-function method produced best agreement with experiment. For the supersonic range, the methods examined included the modified strip analysis, modified two-dimensional loading, rectangular-wing theory, aerodynamic influence coefficients, and quasi-steady second-order theory. These calculations indicated that the use of linearized aerodynamic theory may lead to excessively unconservative estimates of flutter speeds even at relatively low supersonic Mach numbers. In contrast, aerodynamic theories which account for effects of finite wing thickness were indicated to be capable of predicting satisfactory flutter boundaries even into the hypersonic range. A simplified steady-state method, which represents the zero-frequency limiting case of the modified strip analysis, gave satisfactory flutter results in the subsonic and low supersonic to hypersonic ranges for a wing which fluttered at low reduced frequencies. Author

N64-11994 Space Technology Labs., Inc. Redondo Beach, Calif.
LOSS OF STABILITY OF THIN ELASTIC SHELLS UNDER THE EFFECT OF IMPULSIVE LOADS [O POTERE USTOICHIVOSTI TONKIKH UPRUGIKH OBOLOCHEK POD DEISTVIEM IMPULSIVNOI NAGRUZKI]
V. V. Bolotin, G. A. Boichenko, B. P. Makarov, N. I. Sudakova, and Yu. Yu. Shveiko Jan. 1963 14 p refs Transl. into ENGLISH from Stroit. Mekhan. i. Raschet Sooruzhenii, no. 2, 1959 p 9–16
(STL-TRANS-73; Rept. 9990-6351-KU-000)

A discussion is presented of the problem of the stability of a cylindrical panel resting on a rectangular boundary, under the effect of a normal impuse, which is characterized by a rapid increase in load to a certain magnitude and subsequent decrease according to the exponential law. A range of parameters which characterizes this impulse, and in the presence of which snap-through buckling of the shell does not occur, was investigated. The effect of the initial compression and damping decrements on the boundary of the stability region, as well as on the maximum deflections attainable under the effect of the impulse, was studied. Partial differential equations of the nonlinear shell theory were reduced to nonlinear ordinary differential equations by applying the Papkovich–Galerkin method and solved on a continuously acting analog computer. The results of the solution obtained by means of the electronic analog computer are included. These results indicate that an elastic shell can withstand, without buckling, impulsive loads exceeding several times the critical static load. R.T.K.

N64-12082 Rock Island Arsenal Lab., Ill.
POLYURETHANE ELASTOMERS FOR TRACK PAD APPLICATIONS
W. M. Veroeven and J. W. Mc Garvey 10 Sep. 1963 16 p refs
(RIA-63-2900; AD-422711)

A millable polyester urethane elastomer was compounded for optimum stress–strain properties in the 25° to 204° C range and with low heat buildup characteristics. The effects of carbon black structure, particle size, and ratio of carbon black to peroxide curative on these properties were studied. Regular structure ISAF carbon black and peroxide curative levels higher than those normally used in millable polyester urethanes provided vulcanizates with the desired properties. Track pads were fabricated. Author

N64-12153 Menasco Mfg. Co., Burbank, Calif.
RUPTURE TEST, WATERTOWN ARSENAL ROCKET MOTOR CASE, 6AL-6V 2Sn Ti ALLOY, MENASCO P/N 817000-501 MODEL TT207-IR
D. J. Kennedy 6 Jun. 1963 8 p
(A515)

Rupture of the rocket motor case occurred at 1900 psig with evidence of excellent ductility. Design burst pressure was 1389 psig. The initial fracture occurred on the inside diameter of the center section of the rocket case. The test specimen remained in one piece. Tensile strips from the tube section were tested with good results. Author

N64-12263 Army Missile Command, Huntsville, Ala. Redstone Scientific Information Center

BENDING OF A PRISMATIC BEAM UNDER CONDITIONS OF NON-STATIONARY CREEP

U. Zhui-Fyn 13 Mar. 1963 15 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk Arm. SSR, v. 30, no. 3, 1960 p 139–149

(RSIC-4; AD-299093)

Based on tests of K. S. Karapetian, the nonlinear relationship between the stresses and deformations of creep can be expressed by the two straight lines (called the first and second regions of creep), instead of by one curve. In the majority of cases, as shown by the tests, $^{*}R_0 \leq 0.6$ R can be used beyond the limits of these two regions. With this premise as a basis, the direct and inverse problems of the bending of a prismatic beam are investigated. The direct problem reduces to the solution of a nonlinear, Volterra-type, integral equation which can be solved by the method of linear solution. The inverse problem reduces to the solution of two algebraic equations which are given. Author

N64-12268 Aerospace Corp., El Segundo, Calif.

STRESSES AND STRAINS IN MULTI-LAYER DISKS, CYLINDERS, AND SPHERES UNDER PRESSURE LOADING AND AN ARBITRARY RADIAL TEMPERATURE GRADIENT

Norman N. Au 31 Oct. 1963 42 p refs

(Contract AF 04(695)-269)

(SSD-TDR-63-227; TDR-269(4304)-2)

Expressions for elastic stresses and strains due to uniform internal and external pressure loading, and an arbitrary radial temperature gradient for an N-layer concentric circular disk, circular cylinder, and sphere are derived on the basis that the composite disk, cylinder, and sphere are made of layered materials that are elastic, homogeneous, and isotropic. Author

N64-12306 Naval Ordnance Lab., White Oak, Md.

REVERSE YIELDING OF A FULLY AUTOFRETTAGED TUBE OF LARGE WALL RATIO

Victor C. D. Dawson and Arnold E. Seigel 21 Aug. 1963 33 p refs

(NOLTR-63-123; Ballistics Res. Rept.-76; AD-425162)

The equations are developed for the case of a reverse yielded thick-walled cylinder. It is assumed that a cylinder is subjected to an internal pressure which causes plastic flow throughout the wall; the size of the cylinder is such that the residual stresses developed during pressure release cause the cylinder to reyield in compression. The stress equations for the subsequent reapplication of pressure to the reyielded cylinder are also developed. Author

N64-12334 Aerojet-General Corp., Sacramento, Calif.

RESEARCH AND DEVELOPMENT IN SUPPORT OF THE POLARIS PROGRAM. INVESTIGATION OF FILAMENT WINDING PATTERNS [Third Bi-monthly Report] 24 Aug.-24 Oct. 1963

W. Bradley et al 30 Nov. 1963 11 p

(Rept. 0627-1-3; AD-425196)

All six of the isotensoid units required for this program have been fabricated. Three of the four units tested hydrostatically ruptured at pressures exceeding the design burst pressure. The data are being analyzed. An analysis that takes into consideration the strength of the resin in designing isotensoid filament-wound pressure vessels has been developed and programed. Author

N64-12339 Aerojet-General Corp., Sacramento, Calif.

RESEARCH AND DEVELOPMENT IN SUPPORT OF THE POLARIS PROGRAM. TASK II: HYDROSTATIC TEST PROCEDURES [Third Bimonthly Report] 31 Oct. 1963

F. J. Climent et al 30 Nov. 1963 18 p

(Contract NOw 63-0627c(FBM))

(Rept. 0627-11-3; AD-424062)

This report describes some of the results obtained from hydrostatically testing continuous-filament spheroids to burst. Pressurization rates of 10, 100, and 1000 psi/sec were used; burst pressures were found to be sensitive to the rate of pressurization. Author

N64-12376 Air Force Systems Command, Wright-Patterson AFB, Ohio

EFFECT OF ROTARY INERTIA AND OF SHEAR FORCES ON FREE VIBRATIONS OF ROTATING BARS

Jerzy Lipke 21 Jan. 1963 15 p ref Transl. into ENGLISH of an article from Arch. Budowy Maszyn (Poland), v. 7, no. 3, 1960 p 283–294

(FTD-TT-62-1477/1+2; AD-295790)

The problem of the effect produced by transverse rotary inertia and shear forces on the frequency of free-bending vibrations of a propeller blade, with arbitrarily varying cross section, is considered. The calculations indicate that the rotary and transverse forces cause a decrease in the magnitude of coefficients at Ω^2 (Ω = angular velocity) and in the calculated frequencies of free vibrations at rest. The decrease is small in the case of a long bar and increases rapidly as the length decreases. The effect of both factors on ω_{on} and C_n is especially pronounced in components of higher orders (ω_{on} is the angular frequency of the n-series of free vibrations of the bar at rest in sec^{-1} and C_n = coefficients of the free vibrations). P.V.E.

N64-12379 Watertown Arsenal Labs., Mass.

RECTANGULAR TENSILE BAR WEAKENED BY SURFACE CRACKS. PART I: STRESS ANALYSIS

Oscar L. Bowie Mar. 1963 19 p refs

(WAL-TR-811.8/5; AD-400723)

The stress analysis of a rectangular tensile bar weakened by surface cracks is formulated in terms of mapping functions of a complex variable. Although an approximate solution of this problem has been previously considered by Tait, the present derivation specifies the proper load-free boundary conditions on the lateral edges of the rectangle as well as allowing for the variation of both crack length and length/width ratios of the plate. Determination of the stress function is reduced to the solution of a linear system of simultaneous equations. Author

N64-12383 Aberdeen Proving Ground, Md. Ballistic Research Labs.

DYNAMIC STRAINS IN RODS MEASURED WITH BIREFRINGENT STRIPS

John T. Frasier and D. Robinson (Brown U.) Jul. 1963 54 p refs

(BRL-1211)

An experimental and analytical study is presented of the bonded birefringent strip as a means for determination of transient elastic deformations on the surface of opaque bodies. The particular problem investigated consists of a birefringent sheet attached to a metal rod in which a strain pulse is initiated by means of a small explosive charge. A method for analysis of the observed photoelastic fringe patterns is presented, and is shown to give results in good agreement with those obtained in resistance wire strain gage tests. An approximate theoretical analysis of rod-sheet interaction effects is also presented and compared with experimental data. Author

34 STRUCTURAL DESIGN

Includes structural elements; and weight analysis. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 33 Stresses and Loads.

N64-11817* Narmco Research and Development San Diego, Calif.
DEVELOPMENT AND EVALUATION OF THE ELASTIC RECOVERY CONCEPT FOR EXPANDABLE SPACE STRUCTURES Quarterly Progress Report No. 2, 18 Jun. 1963-18 Sep. 1963
N. O. Brink Oct. 1963 54 p refs
(NASA Contract NASw-661)
(NASA CR-55022) OTS: $5.60 ph, $1.82 mf

Elastic recovery is a mechanism whereby a packaged structure expands to its original full size through the use of the energy stored during its packaging. The types of structures to be investigated include manned space stations and shelters, cryogenic storage tanks, solar collectors, and antennas. This report summarizes the effort directed toward determining the applicable materials, methods of structural analysis, and methods for comparing different wall concepts. The methods to be used for evaluating the effect of micrometeoroid and space radiation for the flexible materials are also discussed. Author

N64-11880* National Aeronautics and Space Administration, Washington, D.C.
STRUCTURES AND MATERIALS ASPECTS
Richard V. Rhode *In* Advisory Group for Aeron. Res. and Develop. Proc. of the 12th AGARD Gen. Assembly Sep. 1962 p 71-83 (See N64-11877 03-01)

The accomplishments of the AGARD Structures and Materials Panel are reviewed in relation to conditions existing ten years ago. Fatigue, which was just being recognized, has emerged as the dominant criterion in the design of subsonic planes. Higher speed environments necessitated new methods of structural dynamics and stress analyses. Aerodynamic heating problems were approached from both design and materials aspects, resulting in blunt-nose design and ablating materials development. Other materials advances included cataloging the properties of high strength materials, designing composite materials with properties chosen to match structural requirements, and the development of new fabrication techniques, such as sandwich construction and filament winding. M.P.G.

N64-11925 Mc Donnell Aircraft Corp., St. Louis, Mo.
BRAZED AIRFRAME STRUCTURE EVALUATION Final Report
N. Hefti 10 Dec. 1963 17 p
(Contract AF 33(657)-11215)
(A245; AD-425054)

This report describes evaluation test results of a brazed airframe section designed for optimum producibility. A uniform air pressure was applied to the test section in 2 psi increments. Deflection and set was recorded at each increment of loading. Specimen 0 sustained a uniform pressure of 30 psi without failure or visible indication of yielding. At approximately 27 psi the root rib of Specimen 1 started buckling, and failure of the specimen followed as pressure was increased to 45 psi. Failure of Specimen 2 began at 37 psi as the braze between the corrugation and the spars on the compression side starting failing. Complete failure of the specimen occurred at 45 psi. Author

N64-11962 Thiokol Chemical Corp., Huntsville, Ala. Alpha Div.
EVALUATION OF BORG WARNER HELICAL WRAP ROCKET MOTOR CASES Phase Report
C. V. Steger 4 Oct. 1963 182 p
(Contract ORD-11919)

Two types of tests were performed at three temperature conditions. The tests consisted of three hydroburst and three static tests. One hydroburst test at +75° F demonstrated a hoop-burst strength to density ratio greater than 1.25×10^6 inches. Two other hydroburst tests, one at +140° F and one at −65° F came within 9% of achieving this ratio. Hydroburst test results indicate that the strip lap cases may withstand a higher pressure at ambient temperature than at high and low temperatures. The three cases that were static tested performed in a satisfactory manner with no adverse effects on motor performance. There was no evidence of heated areas on the outer surface of the cases. The first motor operated at a Pmax of 1360 psig and demonstrated a strength to density ratio of 0.767×10^6 inches. This motor was static tested using a standard TX-143 nozzle. The second and third static test motors operated at pressures of 1790 psig and 1805 psig. These motors came within 5% achieving the desired strength to density ratio of 1.0×10^6. Author

N64-12338 Aerojet-General Corp., Sacramento, Calif.
RESEARCH AND DEVELOPMENT IN SUPPORT OF THE POLARIS PROGRAM. TASK V: DEVELOPMENT OF HIGH-STRENGTH IMPREGNATED ROVING FOR FILAMENT WINDING [Third Bimonthly Report] 9 Aug.-10 Oct. 1963
I. Petker et al 20 Nov. 1963 9 p
(Contract NOw 63-0627c(FBM))
(Rept. 0627-V-3; AD-419158)

The current status is as follows: (1) Preliminary studies have been started to establish the test procedures that are to be used for material evaluation. (2) Two types of glass rovings have been received. One type is a one-end O-twist roving and the other is a standard 20-end roving. Gravimetric measurements have been determined on one roll of standard 20-end roving and on three rolls of one-end roving. (3) A revised proposal for the impregnation and development of linearized-end preimpregnated material from various types of glass has been accepted. This revision reduced the tower time 50% from the originally quoted time. (4) Preliminary planning has been started to develop means of maintaining proper alignment of individual rovings during the impregnation process to produce the linearized preimpregnated material. The use of a comb mounted some distance away from the creel to act as a condenser to bring the ends together is being considered. I.v.L.

Collections of NASA Documents

NASA is depositing its technical documents and bibliographic tools in twelve Federal Regional Technical Report Centers. Each Center, located in the organizations listed below, is prepared to furnish the general public such services as personal reference, inter-library loans, photocopy service, and assistance in obtaining retention copies of NASA documents.

California: University of California, Berkeley
University of California, Los Angeles
Colorado: University of Colorado Libraries, Boulder
District of Columbia: Library of Congress
Georgia: Georgia Institute of Technology, Atlanta
Illinois: The John Crerar Library, Chicago
Massachusetts: MIT, Cambridge
Missouri: Linda Hall Library, Kansas City
New York: Columbia University, New York
Pennsylvania: Carnegie Library of Pittsburgh
Texas: Southern Methodist University, Dallas
Washington: University of Washington Library, Seattle

In addition, NASA publications are currently being forwarded to the public libraries in the cities listed below:

Alabama: Birmingham
Alaska: Anchorage
Arizona: Phoenix
Arkansas: Little Rock
California: Fresno, Los Angeles, San Diego, San Francisco
Colorado: Denver
Connecticut: East Hartford, Bridgeport
Delaware: Wilmington
Florida: Jacksonville
Georgia: Atlanta
Idaho: Boise
Illinois: Springfield
Indiana: Fort Wayne, Indianapolis
Iowa: Des Moines
Kansas: Wichita
Kentucky: Louisville
Louisiana: New Orleans
Maine: Portland
Maryland: Baltimore
Massachusetts: Boston
Michigan: Detroit
Minnesota: St. Paul
Mississippi: Jackson
Missouri: Kansas City
Montana: Helena
Nebraska: Omaha
New Hampshire: Manchester
New Jersey: Trenton
New York: New York State Library
North Carolina: Winston-Salem
Ohio: Akron
Cleveland Public Library
Oklahoma: Oklahoma City
Oregon: Portland
Pennsylvania: Philadelphia
South Carolina: Rock Hill
South Dakota: Sioux Falls
Tennessee: Memphis
Texas: Dallas, Houston
Washington: Seattle
Wisconsin: Milwaukee